AVIATION WEEK
A McGRAW-HILL PUBLICATION
MAY 25, 1953
50 CENTS

"OK" —for SURE

MANY of the top honors in the twin-engine transport field are going to Consolidated Vultee's new 44-passenger liner, the Convair 340.

Goodyear Single Disc Brakes and Main Wheels are 100% standard equipment on the Convair 340—the bright new star which is being flown by so many airlines* today.

This brake was selected for the fast and powerful Convair 340 because of its dependability; because it's slip-stream cooled—won't burn up tires, tubes and linings.

Single Disc Brakes and Wheels are but two of many Goodyear Aviation Products which are serving aviation today. Goodyear has been contributing to aviation progress since 1909—pioneered many major advances in tires, tubes, brakes, wheels and other products for the aircraft industry.

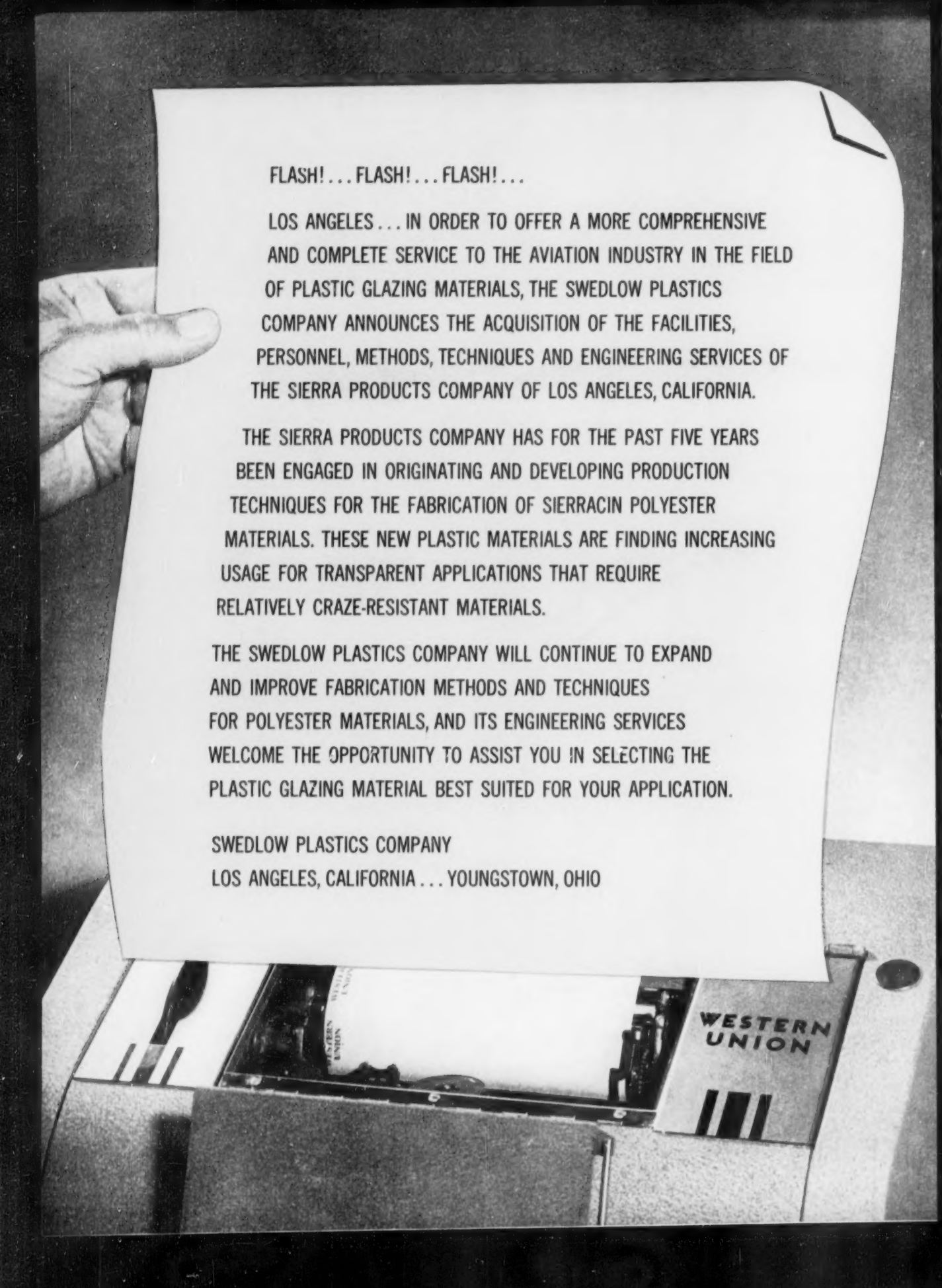
Goodyear, Aviation Products Division
Akron 16, Ohio or
Los Angeles 54, California

GOODYEAR AVIATION PRODUCTS

AVIATION 50th ANNIVERSARY GOODYEAR ONE OF THE PIONEERS

* NOW FLYING OR SOON TO FLY FOR: *Braniff, Chicago & Southern, Continental, Delta, Hawaiian, National, United.*
FOREIGN AIRLINES: *Aeronaves de Mexico, Aero O/Y (Finland), Aerovias Venezolanas (AVENSA), Alitalia (Italy), CMA (Mexico), Cruzeiro do Sul (Brazil) Real (Brazil) JAT (Yugoslavia), KLM Royal Dutch, PAL Philippine, Republic of Indonesia.*

We think you'll like THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network



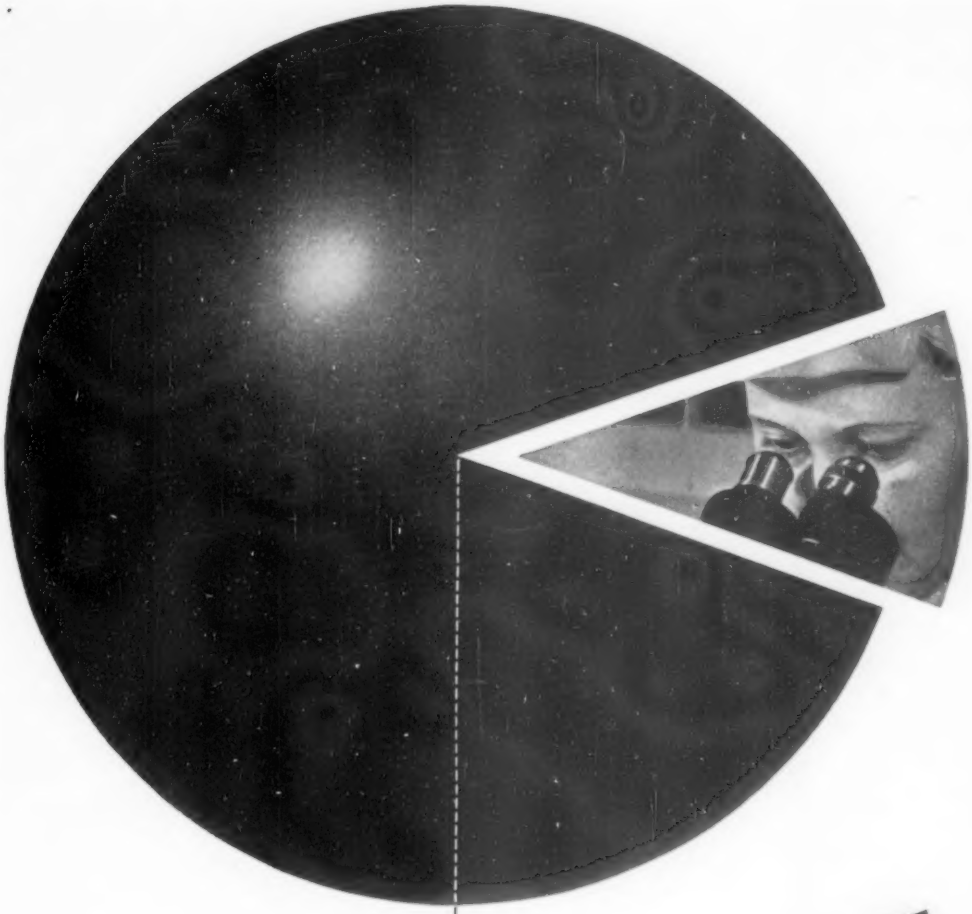
FLASH!...FLASH!...FLASH!...

LOS ANGELES...IN ORDER TO OFFER A MORE COMPREHENSIVE AND COMPLETE SERVICE TO THE AVIATION INDUSTRY IN THE FIELD OF PLASTIC GLAZING MATERIALS, THE SWEDLOW PLASTICS COMPANY ANNOUNCES THE ACQUISITION OF THE FACILITIES, PERSONNEL, METHODS, TECHNIQUES AND ENGINEERING SERVICES OF THE SIERRA PRODUCTS COMPANY OF LOS ANGELES, CALIFORNIA.

THE SIERRA PRODUCTS COMPANY HAS FOR THE PAST FIVE YEARS BEEN ENGAGED IN ORIGINATING AND DEVELOPING PRODUCTION TECHNIQUES FOR THE FABRICATION OF SIERRACIN POLYESTER MATERIALS. THESE NEW PLASTIC MATERIALS ARE FINDING INCREASING USAGE FOR TRANSPARENT APPLICATIONS THAT REQUIRE RELATIVELY CRAZE-RESISTANT MATERIALS.

THE SWEDLOW PLASTICS COMPANY WILL CONTINUE TO EXPAND AND IMPROVE FABRICATION METHODS AND TECHNIQUES FOR POLYESTER MATERIALS, AND ITS ENGINEERING SERVICES WELCOME THE OPPORTUNITY TO ASSIST YOU IN SELECTING THE PLASTIC GLAZING MATERIAL BEST SUITED FOR YOUR APPLICATION.

SWEDLOW PLASTICS COMPANY
LOS ANGELES, CALIFORNIA...YOUNGSTOWN, OHIO



Typical of the careful inspection which New Departure bearing parts must undergo, a raceway is checked by powerful microscope which could reveal the most minute flaw.

New Departure ball bearings are readily available at your equipment dealer or bearing distributor—supplied from the industry's largest nation-wide network of warehouse stocks.

ACCURATE TO THE ND DEGREE

Today's machines . . . automobiles or aircraft . . . conveyors or combines . . . recording instruments or radar installations . . . require accurate, low friction support for their moving parts. Where ball bearings are best for this job, the *best ball bearings* are New Departures, because of the highest quality standards in the industry.

For many New Departure bearings the diameter and roundness of the balls are held within the limits of a few millionths of an inch. And other parts of the bearings . . . rings, races, separators and seals . . . must pass batteries of scientific inspection devices and skilled operators, before and after assembly.

If an application calls for ball bearings of pre-determined accuracy and life expectancy, install New Departures. Keep your eye on the BALL to be sure of your BEARINGS!

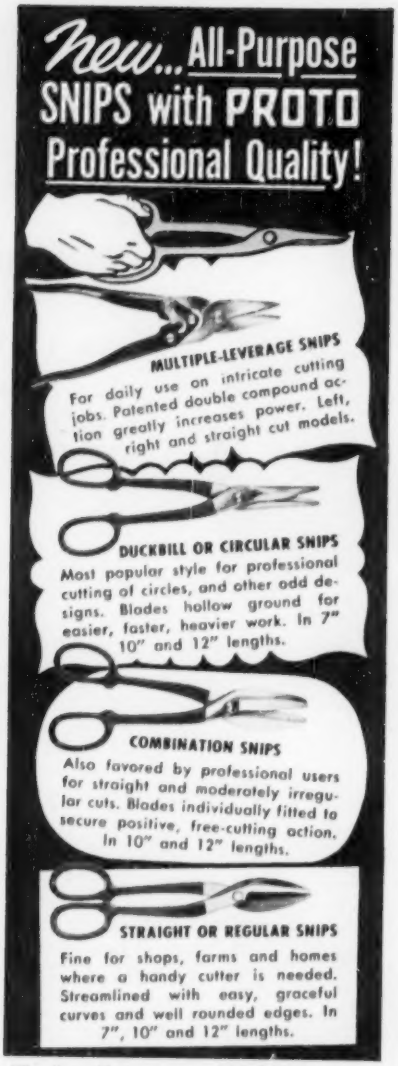
NOTHING ROLLS LIKE A BALL

NEW DEPARTURE

BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

Also Makers of the Famous New Departure Coaster Brake


New... All-Purpose
SNIPS with PROTO
Professional Quality!
MULTIPLE-LEVERAGE SNIPS
For daily use on intricate cutting jobs. Patented double compound action greatly increases power. Left, right and straight cut models.
DUCKBILL OR CIRCULAR SNIPS
Most popular style for professional cutting of circles, and other odd designs. Blades hollow ground for easier, faster, heavier work. In 7" 10" and 12" lengths.
COMBINATION SNIPS
Also favored by professional users for straight and moderately irregular cuts. Blades individually fitted to secure positive, free-cutting action. In 10" and 12" lengths.
STRAIGHT OR REGULAR SNIPS
Fine for shops, farms and homes where a handy cutter is needed. Streamlined with easy, graceful curves and well rounded edges. In 7", 10" and 12" lengths.

Truly *all-purpose*, PROTO's new snips fill the needs of practically all industries, mechanics and craftsmen. Four basic styles cut hundreds of materials. And you get true *professional quality* in PROTO snips! They give smooth, fast, accurate cuts...produce better finished work, clean and unbent ...have great strength and toughness...are sturdily built. Buy these *professional, all-purpose* snips from your PROTO dealer. Send 10¢ for 68-page catalog of entire line to

PLOMB TOOL COMPANY

The PROTO Line Includes Wrenches, Pliers, Screwdrivers, Punches, Chisels, Sockets, Pullers, Industrial Tools, Many Others.

2221Y Santa Fe Ave.
Los Angeles 54, Cal.

5382

PROTO TOOLS
PROTO means PROfessional TOols

Eastern Factory—Jamestown, N.Y.

Aviation Week

Volume 58 — May 25, 1953 — Number 21

Editorial Offices: 330 W. 42nd St., New York 36. Tel. Longacre 4-3000
National Press Bldg., Washington 4, D. C. Tel. National 8-3414

Table of Contents on Page 8

47,215 copies of this issue printed

Robert W. Martin, Jr. ..... *Publisher*

Robert H. Wood ..... *Editor*

Robert B. Hotz
Executive Editor

Merlin H. Mickel
Managing Editor

Albert W. Bentz ..... **News Editor**
Alexander McSurely ..... **Aviation Safety**
David A. Anderton ..... **Engineering**
Irving Stone ..... **Technical**
G. L. Christian ..... **Equipment, Maintenance**
Katherine Johnsen ..... **Congress**
Lee Moore ..... **Transport**
Philip Klass ..... **Avionics**
Scott Reiniger ..... **New Products**
Erwin J. Bulban ..... **Special Assignments**
Richard Balentine ..... **Federal Agencies**
William J. Coughlin ..... **West Coast**
Henry Lefer ..... **News Desk**
Gordon C. Conley ..... **News Desk**
Victoria Giaculli ..... **Editorial Makeup**
Leo T. Tarpey ..... **Printing & Production**

DOMESTIC NEWS BUREAUS

Atlanta 3 ..... 1321 Rhodes-Haverty Bldg.
Chicago 11 ..... 520 No. Michigan Ave.
Cleveland 15 ..... 1510 Hanna Bldg.
Detroit 26 ..... 856 Penobscot Bldg.
Houston 25 ..... 1303 Prudential Bldg.
Los Angeles 17 ..... 1111 Wilshire Blvd.
San Francisco 4 ..... 68 Post St.
Washington 4 ..... 1189 National Press Bldg.

FOREIGN NEWS SERVICE

Editor ..... Joseph K. Van Denburg, Jr.
London ..... Nathaniel McKitterick
Paris ..... Ross Hazeltine
Frankfurt ..... Gerald W. Schroder
Manila ..... Herbert Leopold
Mexico City ..... John Wilhelm
Rio de Janeiro ..... Lionel J. Holmes
Tokyo ..... Alpheus W. Jessup

Aviation Week is served by PRESS ASSOCIATION, INC., a subsidiary of Associated Press.

J. G. Johnson ..... *Business Manager*

Sales Representatives: J. C. Anthony, **New York**; H. P. Johnson, **Cleveland**; L. J. Biel, **Chicago**; W. E. Donnell, **St. Louis**; E. P. Blanchard, Jr., **Boston**; James Cash, **Dallas**; Robert H. Sidur, **Atlanta**; R. F. Dorland, Jr., **San Francisco**; C. F. McReynolds, **Los Angeles**; W. S. Hessey, **Philadelphia**: Other sales offices in **Pittsburgh, Detroit, London.**
Research and Marketing: Catherine Miner.

AVIATION WEEK • May 25, 1953 • Vol. 58—No. 21
Member ABP and ABC

Published weekly by McGraw-Hill Publishing Company, James H. McGraw (1860-1948), Founder. **Publication Office: 99-129 North Broadway, Albany 1, N. Y.**
Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.
Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 North Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 36, N. Y. Allow ten days for change of address.
Subscriptions are solicited only from persons having a commercial or professional interest in aviation. Position and company connection must be indicated on subscription orders.
Single copies 50¢. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada, $8 a year; $12 for two years; $16 for three years. Payable in Canadian currency at par; other Western Hemisphere, $10 a year; $16 for two years; $20 for three years. All other countries, $20 a year; $30 for two years; $40 for three years. Entered as second-class matter, July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U. S. A.

Copyright 1953 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Cable Address: "McGraw-Hill New York." Publications combined with AVIATION WEEK are AVIATION, AVIATION NEWS, AIR TRANSPORT, AERONAUTICAL ENGINEERING and AIRCRAFT JOURNAL. All rights to these names are reserved by McGraw-Hill Publishing Co.

Backing up everything we make...
AiRESEARCH WORLD-WIDE SERVICE

Today, AiResearch is producing more than 750 individual aircraft accessories! These precision products, which are combined into complete systems or utilized as individual units, are on almost every U. S. commercial and military plane. Our Customer Service organization of 242 people operates to back up our products *anywhere in the world!*

What AiResearch service provides:

- A staff of thirty-six technicians who are permanently located with the armed forces and with airline and airframe companies throughout the world.
- Eight roving trouble-shooter specialists in the field at home and abroad.
- A "Headquarters" engineering group for immediate advice and action on customer problems.
- Product training of customer personnel at AiResearch (25,000 hours annually) or at the customer's location.
- Accredited overhaul and service agencies throughout the United States, the British Isles and Europe.

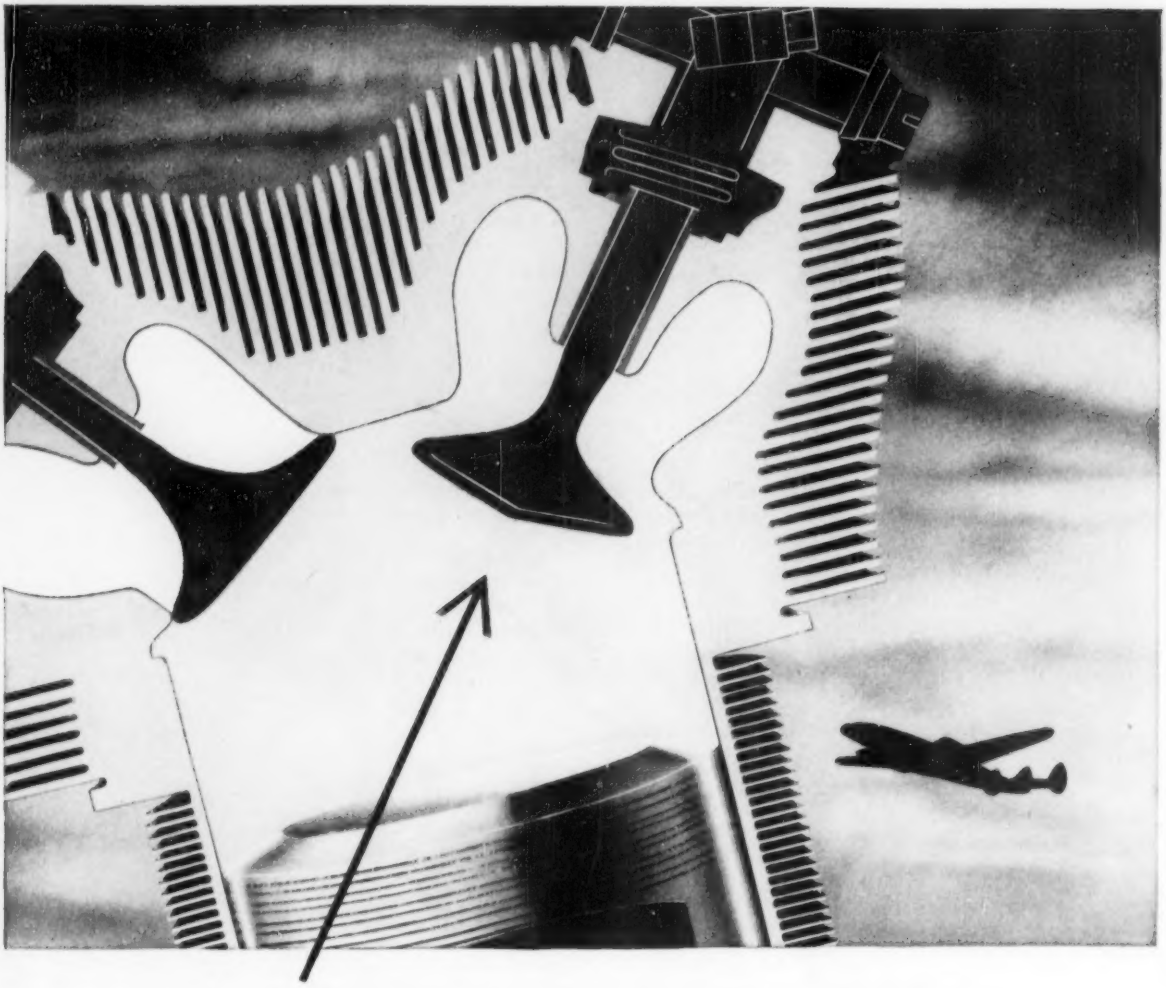
AiResearch Manufacturing Company

A DIVISION OF THE GARRETT CORPORATION

LOS ANGELES 45, CALIFORNIA • PHOENIX, ARIZONA

DESIGNER AND MANUFACTURER OF AIRCRAFT EQUIPMENT IN THESE MAJOR CATEGORIES

Air Turbine Refrigeration | Heat Transfer Equipment | Electric Actuators | Gas Turbines | Cabin Superchargers | Pneumatic Power Units | Electronic Controls | Cabin Pressure Controls | Temperature Controls



This valve is a Spendthrift

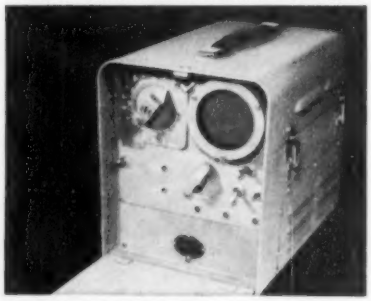
But it needn't be! Valve clearance trouble, with resulting fuel and power waste, is easily detected by the Sperry Engine Analyzer. By using vibration analysis to check each cylinder under normal operating conditions, valve clearances can be adjusted for smoother engine performance. Result . . . engines develop full power—run cooler—use less fuel—last longer.

Vibration analysis, exclusive with the Sperry Engine Analyzer, can be employed either in flight or on the ground. When using the Engine Analyzer, valve clearance can be easily checked at each inspection and overhaul—a profitable procedure for airlines and executive aircraft operators.

In addition to vibration analysis, the Sperry Engine Analyzer also provides detailed ignition analysis. It immediately detects, locates and identifies irregularities in aircraft power plants—either during flight or on the ground. Aside from saving ground maintenance time, the Engine Analyzer enables the flight engineer to maintain proper operating conditions at all times and prevents unnecessary component replacements.

Our nearest district office will give you complete data upon request.

SPERRY PORTABLE ENGINE ANALYZER



ENGINE ANALYZER IS MANUFACTURED AND LICENSED UNDER JOHN E. LINDBERGH, JR. PAT. NO. 2518227, OTHER U.S. AND FOREIGN PATENTS PENDING.

SPERRY GYROSCOPE COMPANY
DIVISION OF THE SPERRY CORPORATION

GREAT NECK, NEW YORK • CLEVELAND • NEW ORLEANS • BROOKLYN • LOS ANGELES • SEATTLE • SAN FRANCISCO
IN CANADA • SPERRY GYROSCOPE COMPANY OF CANADA, LIMITED, MONTREAL, QUEBEC

NEWS DIGEST

JACQUELINE COCHRAN flying the unmarked Canadair-built F-86E (Avro Canada Orenda turbojet) in which she averaged 652 mph. around a 62.1-mi. closed course at Muroc Dry Lake, Calif., on May 18. Miss Cochran said she exceeded speed of sound twice during the record runs. Her new mark, still to be officially recognized by the National Aeronautic Assn., surpasses former world speed record set by USAF Col. Fred J. Ascani in a GE J47-powered F-86E of 635.6 mph. and the previous women's speed mark of 540 mph. set by Mme. Jacqueline Auriol in a French-built DH Vampire jet fighter. Miss Cochran for the past year has been flight consultant to Canadair, Ltd., Montreal, which is turning out Sabres under license from North American Aviation.

Polish Pilot Escapes Iron Curtain in MiG

A Polish air force pilot crash-landed a MiG-15 last week in Denmark, the third Russian-built sweptwing jet fighter to fall into Allied hands.

The Communist flyer circled over Roenne, Bornholm Island, for 75 min., eyewitnesses report, then landed on a rocky army training field and bounced into a clump of trees, tearing off a wing. The pilot told Danish police he broke away from a MiG formation flying over Polish territory.

The first Polish pilot to escape over the Iron Curtain, Francis Gareeki, last March gave Allied military observers their first look at an intact MiG. (AVIATION WEEK Mar. 16, p. 16). In 1951, a MiG was downed in waters off Korea, salvaged and brought to the U. S. for tear-down inspection.

Domestic

James Verner, executive director of Civil Aeronautics Board, has resigned effective June 1 to join the Washington law firm of Turney & Turney. No successor has been named.

Boeing Airplane Co. has confirmed that its prototype jet transport will be powered by Pratt & Whitney J57s (AVIATION WEEK Dec. 1, 1952, p. 18).

A DC-3 operated by Delta-Chicago & Southern Air Lines crashed last week in a blinding hail and rain storm near Waskom, Tex., the first disaster of the less-than-one-month-old merged carrier. Nineteen persons were killed, one survived.

Braniff Airways' DC-4 skidded after landing on a rain-slick runway May 15 at Love Field in Dallas, hurtled through an airport fence and crashed into a dirt embankment. None of the 48 passengers and five crew members was injured. Pilot says the accident probably could have been avoided with reversible propellers and/or an additional 1,000 ft. on the 5,200-ft. north-south runway.

A $2.4-million USAF contract for 1,400 ignition analyzers and associated equipment has been awarded to Scintilla Magneto Division, Bendix Aviation Corp. They will be used on C-119s, C-54s, B-29s and C-97s.

Perfect safety record from Jan. 2, 1949, through Dec. 31, 1952, is cited in California Central Airlines' second consecutive citation awarded by the California Safety Council.

Air Force has received its third straight annual award from the National Safety Council for reducing ground accidents. The 1952 accident rate was 14% under 1951.

More than 1,000 civil pilots in the U. S. are older than 60 years, Dr. Ross McFarland of Harvard University School of Public Health reports.

C-124 Globemasters have transported 29,814-lb. tractors in airlift operations from Westover AFB, Mass., to Thule Air Base, Greenland.

Financial

Boeing Airplane Co., Seattle, had net earnings of $3,467,845 during the first quarter of 1953, compared with $1,904,280 for the corresponding period last year.

United Aircraft Corp., East Hartford, Conn., reports sales during the first three months of this year were $202,599,365, returning a net income of $5,899,558. Backlog at quarter's end: $1.64 billion.

United Air Lines' net income for the first quarter totaled $340,963 after taxes dropping $311,727 from profits reported for January-March of 1952. Operating revenues were $37,241,118, a 16% increase over last year; but operating expenses climbed 20% to $36,142,380.

Continental Air Lines reports a first-quarter net income of $683,011, more than 18 times the $37,074 net for the first period of last year. Operating revenues climbed 6% to reach a total of $2,491,792.

International

New $17-million Jan Smuts Airport at Johannesburg, South Africa, will open June 1. Pan American World Airways Super Constellations and British Overseas Airways Corp. Comets already are taking off from the 10,500-ft. main and 8,250-ft. secondary runways.

CF-100s will tour Canada next month, giving the nation its first look at Royal Canadian Air Force's new twin-jet fighter.

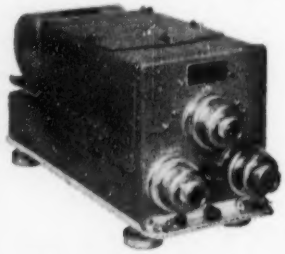
KLM Royal Dutch Airlines has cut trans-Atlantic airfreight rates 50-60%.

in THIS Cockpit!

It's Equipped with the

ARC

CHANNEL ISOLATOR



- **Private Input Channels for Pilot and Co-Pilot**
- **Individual Speakers**
- **Headphones Instantly Available**

You can avoid "party line" radio confusion with the ARC Isolation Amplifier. It accepts up to 10 audio input channels for each pilot from range and communication receivers, ADFs, marker beacon receivers, transmitter sidetones, interphones as desired. Pilot and co-pilot select any combination without cross-cockpit interference—an efficiency plus in complex navigation and communication situations. Headphone or speaker operation is provided at the flick of a switch.

ARC

ARC Type F-11A is CAATC No. IR4-1. Delivery in 14 or 28 volt DC models. Write today for complete details.

Aircraft Radio Corporation

Boonton, New Jersey

Dependable Electronic Equipment Since 1928

The Aviation Week

May 25, 1953

Headline News

Hughes' Avionics Giant..... 14
Defense Earmarks 60% for Air Power.. 16
CAA Names Howell Airport Director.. 16
P. O. Wants to Cut Airmail Rates..... 17
Tigers, Slick File on Merger..... 18
Ryan Reveals Jet Trainer Design..... 19
CAA Merges 2 Airways Divisions..... 19
AF Stratojet Flies 12,000 Mi. Nonstop.. 19
Army Aim: More Reliable Copters.... 20
The Air Lessons of Korea..... 23
Air Force Chief..... 33

•

Aeronautical Engineering

NACA Charts Spheres of Ignorance... 36
Assault Transport Details..... 45

•

Production

Why Do Aircraft Cost So Much?..... 46
Solar Rollwelder Cuts Jet Costs..... 62

•

Equipment

LSI Tells Pilot Best Airspeed..... 67
Powerful Cooler for Supersonic Jets.. 71
Analyzers Cut Sparkplug Troubles.... 72

•

Avionics

Simulator to Train Bomber Crews.... 74

•

Financial

What Airmail Decision Can Mean..... 78

•

Air Transport

CAB Kills Study of Airline Profits.... 96
DC-7 Makes Maiden Test Flight..... 99
Final Mail Rate Puts NEA Out of Red..102
Trunk Airline Profit Record.....103

•

Editorials

Trade Not Aid 106
What Happens to Aircraft Profits?....106

•

Departments

News Digest 7
Picture Page 9
Industry Observer 10
Who's Where 10
Washington Roundup..... 13
Thrust & Drag..... 42
Filter Center 77
New Aviation Products..... 82
Also on the Market..... 86
CAB Orders 103
CAB Calendar.....103
Shortlines 104
Aviation Calendar 104

Picture Credits

9—(top) Howard Levy; (bottom) North American; 14-15—Hughes; 16—Wide World; 18—USN; 23—USAF; 45—(all except lower right) Levy-Shipp; 99—(top) Wide World.

AIRBORNE

Controls and Control Systems

Do you have a control, or control system, problem? If so, we'd like to help you solve it. We've enlarged our research and development section so as to be of greater service to the aircraft industry. One project, now under way, is development of an even better control system for positioning an actuator by manual remote control or keeping two or more actuators in the desired relative positions. Another is widening the applicability of 26 volt DC control and control systems. A third is the perfecting of a 400 cycle control to operate with our 400 cycle, 110 volt motor and new actuators.

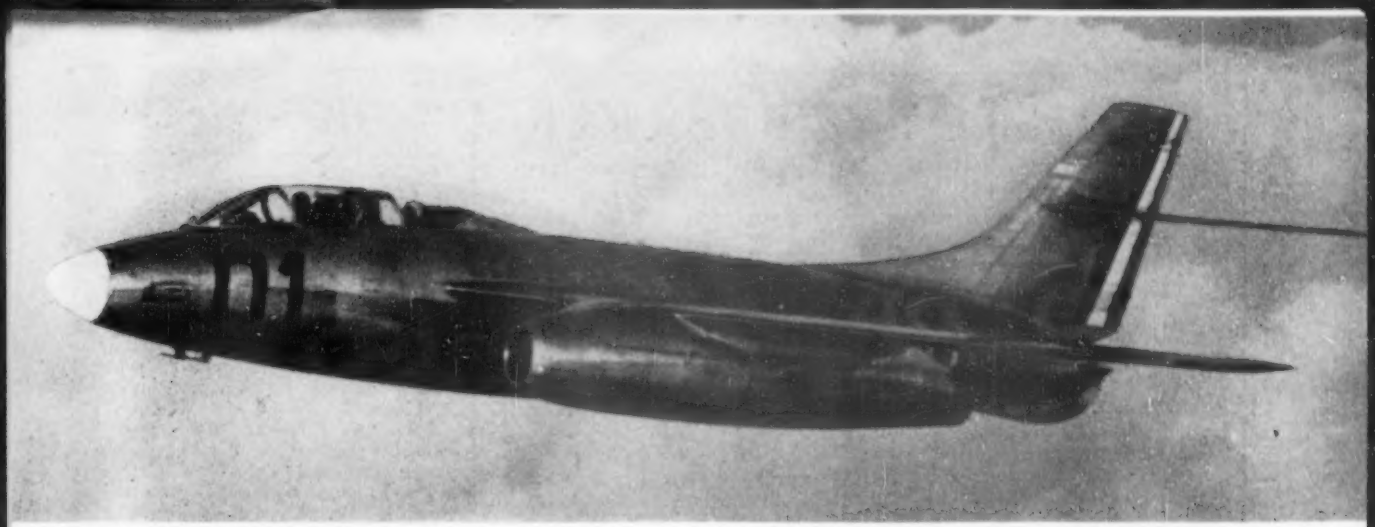
Our broad experience in the design and manufacture of electromechanical actuators, coupled with our expanded facilities for research and development work, enables us to give you more help. Let us develop a control system to exactly meet your application. Our recommendations will be based on an analysis of your needs.

A full statement of your requirements will permit us to study your problem and estimate our ability to solve it.

AIRBORNE

ACCESSORIES CORPORATION

1414 Chestnut Avenue
Hillside 5, N. J.

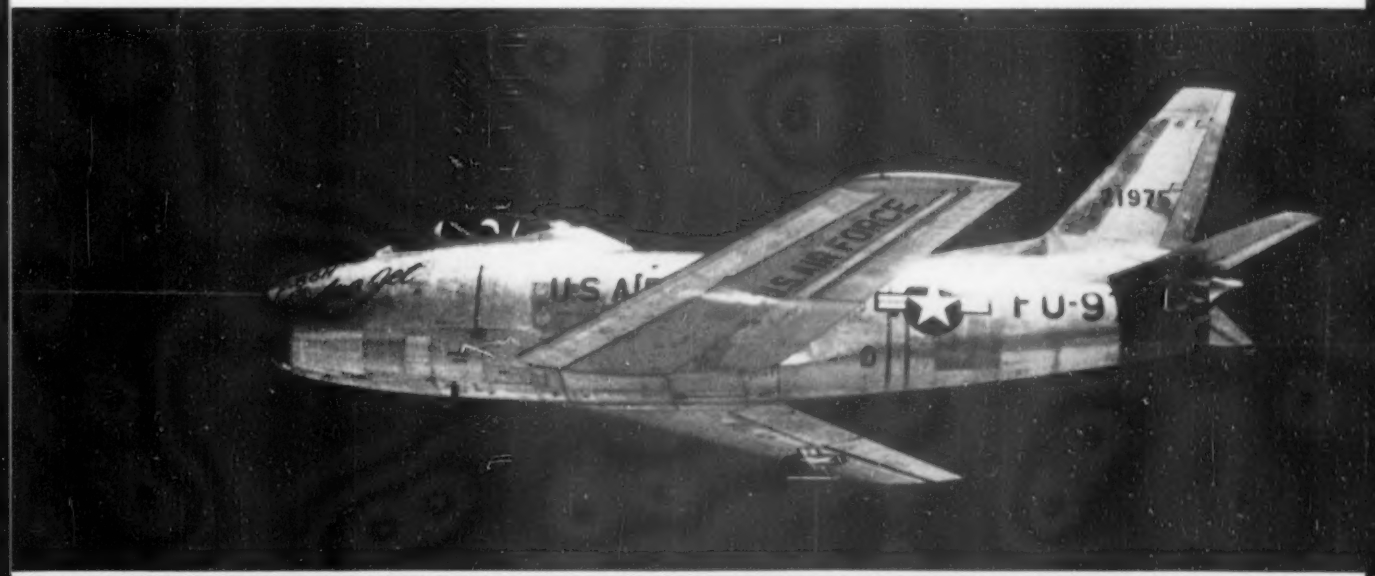


FRENCH TWIN-JET TESTED—New Sud-Ouest S.O. 4050 Vautour (Vulture) seen aloft for the first time is sweptwing multi-purpose single- or two-seat ground support plane, light bomber, all-weather fighter, or reconnaissance type. Here it carries two, seated in tandem. Although this first prototype is powered by two 5,500-lb.-thrust Atar jets in underwing nacelles, giving it sonic speed performance in level flight, more powerful jets can be fitted.

New Military Planes Try Their Wings

NEW GRUMMAN ALOFT—First flight view (right) of new Grumman XS2F-1 submarine hunter-killer for Navy. The four-place twin-engine (1,425-hp. Wright Cyclones) craft is slated to replace the single-engine Grumman AF-2 Guardian. Numerous avionic detection and tracking devices will permit pilot of the new Grumman to attack an enemy sub without ever seeing it. Several features have been incorporated in the design to provide good stability while maneuvering at low speeds, notably large-span spoiler-type devices.

LATEST SABRE IN THE SKY—First flight view (below) of latest North American Sabre model, the F-86H, powered by a more powerful engine than previous Sabres, a General Electric J73 of approximately 9,000 lb. thrust. Slightly larger than current Sabres, the F-86H is a dual-purpose day fighter and ground attack plane. It has a clam-shell type canopy and sturdier landing gear than earlier F-86s. It has six .50-cal. machine guns.



INDUSTRY OBSERVER

► A Boeing B-47B bomber on display at Carswell AFB, Tex., last week had clusters of tiny vertical metal vanes protruding from the upper wing surface in a span-wise row from near the wingtip to about half the distance inboard. They obviously were vortex generators designed to prevent flow separation at high speeds, and presumably to increase speed above original design speed.

► William T. Piper, who has built more civilian aircraft with conventional landing gear than any other manufacturer, has virtually abandoned tail wheels in favor of the tricycle gear, except for specialized installations such as agricultural spray planes.

► Military sources say the jet pod-nacelle designed for the Boeing B-47C, which was to be powered by four Allison J71 engines, is one of the cleanest and most successful engine installation designs yet accomplished. Suggestion has been made that the design, financed by USAF, be turned over for use on the Douglas RB-66 which will have two pod-nacelle installations of the same engine.

► Piasecki Helicopter Corp., whose vice president, Lee Douglas, had much to do with the design of the jet-rotor XH-17 at Kellett before Hughes Aircraft purchased the incomplete aircraft, is reported developing a somewhat similar "hot blade" rotor design.

► Parsons Corp. Aircraft Division, Traverse City, Mich., claims title as the world's largest maker of helicopter blades; having manufactured more than 10,000 main and auxiliary rotor blades.

► Doman Helicopters, Inc., will get 250 hp. each out of the two Boeing gas turbines which are to be installed in a forthcoming copter, although current models of the turbine are rated at only 210 hp. The additional power is the result of a redesign of the compressor section of the turbine which makes possible a higher compression ratio.

► Trainees at Army's Helicopter School, Ft. Sill, Okla., flew 18,040 flying hours, in the 11-month period ended Mar. 27, and made 49,981 auto-rotation practice landings (3 per hour). There were 11 accidents, no injuries.

► Recent anti-icing tests completed on the Prewitt metal helicopter rotor blades indicate that sufficient heat is "thrown away" in the exhaust from the copter's powerplant to de-ice the blades effectively, if it is ducted through the hollow spar at the blade's leading edge.

► Bell Aircraft has a new electric cyclic thermal de-icing blade system designed for a large tandem-rotor machine (presumably its XHSL-1 anti-submarine helicopter) which represents 1.5% of the craft's gross weight and uses 2% of engine power. Both these requirements are expected to be reduced considerably with more suitable generators.

► Doman expects to have its first YH-31 military copter ready for Army evaluation at Ft. Bragg by next October. With a gross weight of 4,419 lb., it will carry a 1,559-lb. payload, with capability of 1,300 ft./min. climb.

► Piper's Lock Haven, Pa., plant now is producing lightplanes at a rate of 2,600 a year. Piper told AVIATION WEEK the current market for the four-place Pacer business plane and the new twin-engine Apache is the best in years. Deliveries on the Apache will start by late summer, with the price tag still at $25,000.

► Air Transport Assn. reports the following 1952 operating costs for transport types from domestic airline reports (figures are direct flight and maintenance costs per aircraft mile flown, do not include depreciation): Martin 4-0-4, 58 cents; Convair 240, 67 cents; Douglas DC-4, 67 cents; Douglas DC-6, 74 cents; Douglas DC-6B, 76 cents; Lockheed 749, 80 cents; Lockheed 1049, 91 cents; Boeing Stratocruiser, $1.37.

WHO'S WHERE

In the Front Office

William D. McCoy is new president and board chairman of Air America, Inc.

J. V. Naish, executive vice president of Consolidated Vultee Aircraft Corp., San Diego, has assumed additional duties as manager of Convair's Guided Missile Division. He is taking over responsibilities of **Gage Irving**, who has been granted extended sick leave.

James H. Cobb has been elected vice president-public relations and advertising of recently merged Delta-C&S Air Lines. **George E. Bounds** is new publicity and advertising director.

Lloyd L. Hill has been appointed vice president-general manager of Summers Gyroscope Co., Santa Monica, Calif.

Michael J. McCormack, former director of production for AF Eastern Air Procurement District, has been elected vice president-general sales manager of Breeze Corp., Newark, N. J.

Changes

James C. Robertson is new assistant to the vice president-operations of Northwest Orient Airlines.

George C. Martin has been appointed chief engineer of Boeing Airplane Co.'s Seattle Division. **Maynard L. Pennell** has been named chief project engineer-aircraft, and **Frank Terdina** is engineering manager of the Industrial Products Division.

L. Eugene Root has been named director of the new development planning program at Lockheed Aircraft Corp., Burbank, Calif.

Eugene J. Barney has been appointed director of general supply, Allison Division of General Motors Corp., Indianapolis. Other changes: **Jackson T. Wills**, Washington zone manager; **C. K. Nigh**, Washington field service supervisor.

Stanley G. Markusen has been appointed public relations director for Sabena Belgian Airlines. **William A. Clary** is new cargo sales manager.

Gordon Israel has resigned as ass't. chief engineer at Grumman Aircraft Engineering Corp. He was well-known as a racing pilot before joining the firm and was project engineer on Grumman's F7F Tigercat, F9F, Panther and the Mallard executive amphibian.

Honors and Elections

J. W. Barton, Boeing's chief cost accountant, and **Robert S. Ames**, head of canopy and laminates operations at Goodyear Aircraft Corp., Akron, Ohio, have been awarded one-year A. P. Sloan fellowships at Massachusetts Institute of Technology.

John D. McPherson, head of Airborne Flower & Freight Traffic, San Francisco, is first president of the newly organized Air Freight Forwarders Assn.

Dennis W. Howe, former British naval pilot, has won a Seaboard & Western Airlines fellowship for airfreight study at Columbia University graduate school, N. Y.

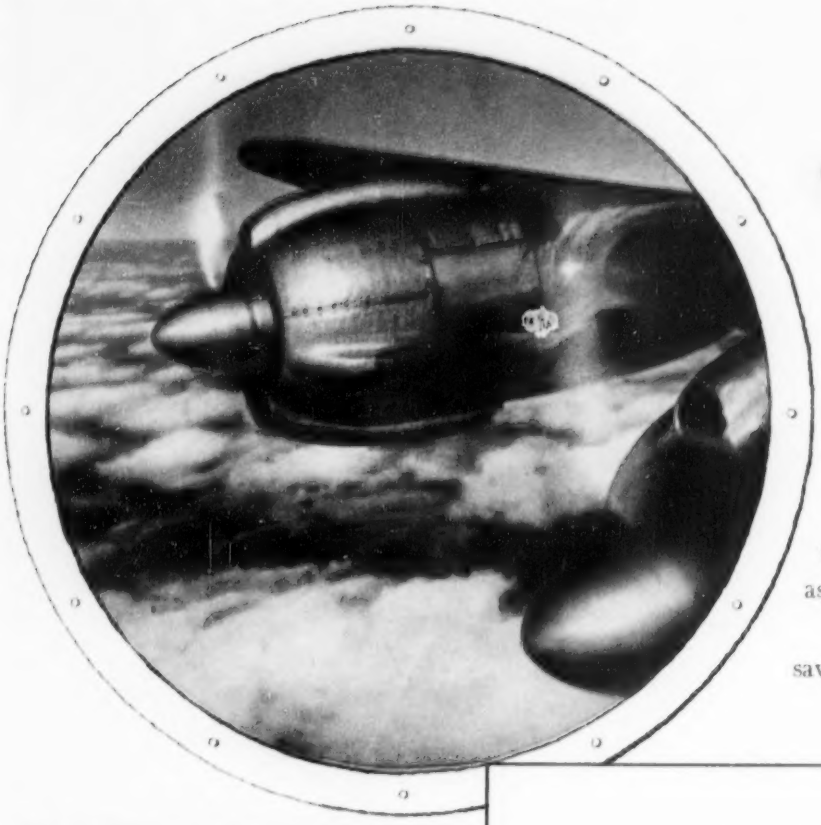
HAMILTON STANDARD . . . leader for years in propeller design and production, is supplying other equipment for such outstanding new aircraft as the Douglas RB-66, Air Force jet reconnaissance bomber.

Wherever Man Flies.

HAMILTON STANDARD

Propellers • Starters • Air-Conditioners • Fuel Controls • Auxiliary Drives • Hydraulic Pumps

HAMILTON STANDARD, WINDSOR LOCKS, CONNECTICUT



TIME FLIES
-do you?

Time is always flying. You can save some of your time by flying, too. Yes, ride the airlines regularly. You'll save moments, minutes, days, weeks to use as you choose—for business or pleasure. Next time... save time... *your* time. Fly!

You're looking out the window of a TWA Constellation at the Rohr-built "power packages" on the wing. For the Lockheed Constellation and other great airplanes, Rohr manufactures and assembles the engine mount, cowl panels, ducts, exhaust system, tanks, and other units which transform a Wright engine into a complete, ready-to-install "power package."

power packages by
ROHR

WORLD'S LARGEST PRODUCER OF READY-TO-INSTALL POWER PACKAGES FOR AIRPLANES

ROHR
AIRCRAFT CORPORATION

CHULA VISTA AND RIVERSIDE CALIFORNIA

Washington Roundup

Still More Stretchout?

Congressional leaders see no hope of completing action on the fiscal 1954 defense budget, which cuts back aircraft procurement money from the Truman budget's $8.9 billion to $4.9 billion, by July 1. This simply means a further stretchout in the air power program.

The services have to hold back on contract letting until they know definitely how much money they are going to have for the year.

• **House Appropriations Committee** has set June 22 as target date for reporting out the defense money bill for floor action, but there is not much optimism about meeting this. And even if the target is met, it would be virtually impossible to race the measure through House and Senate to the White House in the one week before July 1.

• **Senate Appropriations Committee** won't wind up hearings of the measure until after the House has finished with it, because members want to weigh House actions. There is little chance the bill will reach the Senate floor, where it will touch off a hot controversy over air power money, by July 1.

• **Then, after Senate action,** House and Senate differences have to be threshed out by conferees. The measure then has to go back to House and Senate—which frequently toss the bills back to the conferees several times.

Behind the Budget

This is what happened in the development of the Eisenhower defense budget which lopped $5.1 billion off funds for USAF and $919 million off funds for Naval Aviation:

• **Budget Director Joseph Dodge** instructed Defense Secretary Charles Wilson to cut $4.5 billion off the $41-billion Truman budget and report what the result would be.

• **The services developed numerous** alternative budget plans. Three plans were submitted by Wilson, with recommendations, to the National Security Council. One, it is understood, proposed a $2-billion increase for USAF.

• **The budget plan approved** by the council was submitted by the President, its chairman, to Wilson with this statement, indicating that it is not in line with Wilson's recommendations:

"The report on your review of the 1954 budget . . . has been . . . carefully considered in relation to the Administration's stated policies and budget objectives. To meet these objectives the revisions in appropriations set forth . . . will be necessary. You are expected to adjust your recommendations accordingly and present these revisions to the Appropriations Committee."

Keller's Holdings

Some Washington observers feel there is inequity in the application of the law which bans government officials from transacting business with firms in which they have a financial interest—whether it be a direct or indirect one.

They point out:

• Senators insisted that Charles E. Wilson dispose of General Motors stock valued at $2.6 million before confirming him as Defense Secretary. He did this, and undersecretary Roger Kyes disposed of GM stock valued at $165,000.

• Similarly, Secretary for Air Harold Talbott disposed of Chrysler Corp. stock valued at $154,000 and stock in seven other firms—Baldwin-Lima-Hamilton Corp., Electric Auto Lite Co., Madison Square Garden Corp., Russell Manufacturing Co., Standard Packaging Corp., The Talbott Corp., Vita Meter Corp. His only remaining holding in a firm interested in defense business: an option on 5,000 Standard Packaging shares. As soon as legal difficulties are worked out, he reports, he will either promptly dispose of this option or the stock that is received under it.

• Yet K. T. Keller, the director of the guided missiles program since 1950, whose appointment didn't come under senatorial scrutiny, was permitted to keep his holdings in Chrysler Corp., a major participant in the guided missiles program. Chrysler recently reported to the Securities and Exchange Commission that, as of Jan. 31 of this year:

Keller was a director of the firm (since 1927). He held 30,864 shares of common stock in the firm. At $77 a share, this would amount to a total of about $2.4 million. His salaries and fees for the year 1952 totaled $300,900.

Wordage and Paper

CAB seems well on the way to setting a record for accumulating paper and wordage with its proceedings on the role of irregular carriers.

The case has been going less than a year, and will take about another year to complete.

So far, the transcript of the proceedings totals 30,000 pages, enough wordage for about 50 average-length books. Its price: $6,000. American Air Transport's Philip Mann displayed the record, reaching almost to his shoulder, to Senate Small Business Committee.

1 TRANSCRIPT: 30,000 pages.

Nonskeds estimate that they already have spent a total of about $100,000 in legal fees. In addition, Air Coach Transport Assn. has spent $20,000 on the case. The expense to the larger scheduled airline industry probably exceeds this.

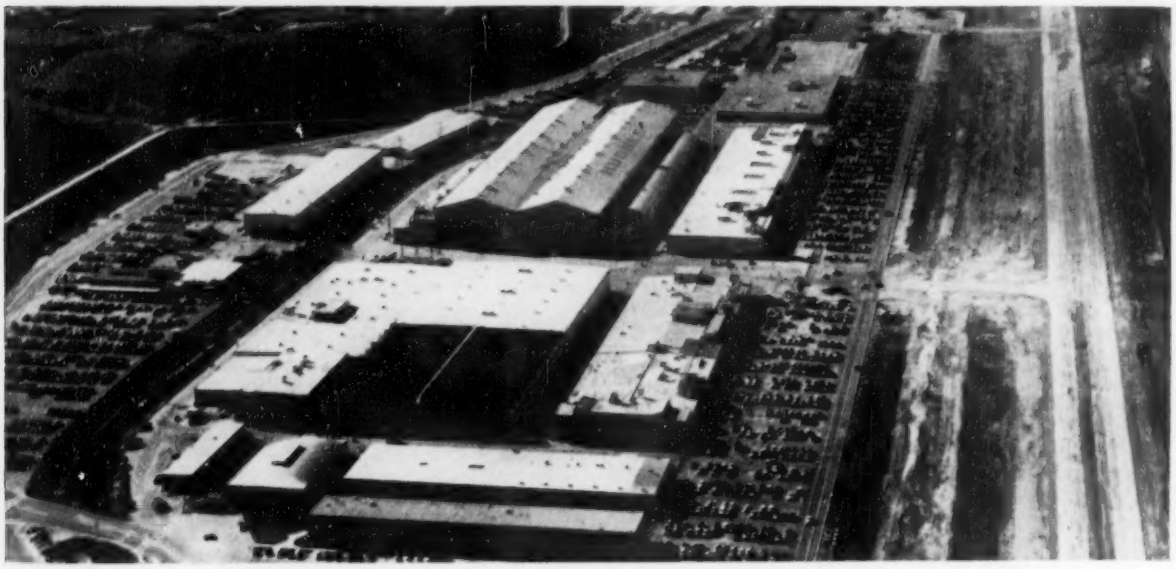
Small Business Committee's chairman, Sen. Edward Thye, thinks the nonsked situation may be well along to solution before the CAB proceeding is completed. He believes in taking up cases as they arise, instead of going into past history and aiming to find a general solution under which all nonsked situations might be solved. Quietly, Thye is pinning the Board down on its actions on individual nonsked cases, presented to his committee, to determine their wisdom and justice.

—Katherine Johnsen

AVIATION WEEK

VOL. 58, NO. 21

MAY 25, 1953



AERIAL VIEW of Hughes Aircraft Co., Culver City, Calif., shows big avionics firm's layout including runway, right.

Hughes Takes Wraps Off Avionics Giant

- **Firm is major producer of air defense weapons.**
- **And its annual sales now top $200 million.**

By Philip Klass

Culver City, Calif.—Disclosure that Hughes Aircraft has grown from a small airplane company into a profitable $200-million-a-year avionics concern with a $600-million backlog last week gave added significance to speculations about its sale.

Story of the company's phenomenal conversion from a business grossing $1.5 million in 1947 into a major power in the electrical industry, and probably the nation's largest producer of avionics (electronics in aviation) equipment, was revealed to AVIATION WEEK by company officials.

The story could not be told before, on orders from Howard Hughes.

▶ **Negotiation and Speculation**—The status of negotiations between Hughes and Lockheed Aircraft Co. remained unchanged (AVIATION WEEK May 11, p. 7). Both parties have denied that any deal exists.

Prior to the Lockheed conversations, Hughes' talks with Convair, Westinghouse and others had fallen through.

The Gamble That Paid Off

Howard Hughes originally did not intend to turn his airplane company into a top avionics concern. The company backed into the avionics field via a missile study and development contract.

In the early postwar years when airplane contracts were hard to get, Hughes settled for an air-to-air missile program which eventually developed into the present Falcon.

The study and development of suitable avionic control and guidance for the missile forced Hughes to assemble a small electronics staff. Two early members of this staff, who have since become HAC vice presidents, were Dr. Simon Ramo and Dr. Dean Wooldridge.

▶ **The Big Gamble**—In 1947, Hughes entered the low bid and received an Air Force contract to produce the APG-33 radar for use in all-weather fighters. The APG-33 was an improved, lightweight version of the APG-3 developed by General Electric late in World War II. With little radar production know-how or facilities at that stage, Hughes was taking a big gamble. But it established the company in the then infant interceptor fire control field.

Shortly afterward, Hughes received an Air Force contract to modify the Sperry A-1 computing gunsight for use with the APG-33. In the summer of 1948, when the cold war threatened to get hotter, the Air Force rushed this "system," called the E-1, into production. Hughes admits it was a much bigger job than anyone had anticipated and required major redesign.

E-1 system experience suggested a much improved and more powerful fire control system, and Hughes soon was at work on the systems which are now used on the F-86D, F-94C, and F-89D.

▶ **The Payoff**—In the spring of 1950, in competition with more than 20 other companies – including GE, Westinghouse and Sperry Gyro—Hughes was selected to develop the advanced fire control systems for the USAF's new stable of supersonic interceptors, first of which is the Convair F-102.

Hughes' previous fire control experience and the fact that the advanced system was to fire Hughes-developed missiles undoubtedly played a part in the Air Force selection.

It is reported Hughes has asked a steep price, approximately $70-$90 million, for his avionics company.

(In discussing this article with AVIATION WEEK, Hughes termed as absurd and without foundation the report that a deal with Lockheed might involve Super Constellations for Trans World Airlines in which Hughes has a controlling interest.)

▶**A Jackpot**—If Hughes Aircraft Company is sold, its purchaser will have acquired one of the nation's largest collections of top avionics experts, an otherwise unavailable asset in today's tight technical labor market. It also would own one of the country's newest and most modern avionics manufacturing plants, equipped with the finest precision machine tools—many of them imported—that money can buy.

Of particular significance, if the purchaser should be an aircraft company or presently outside the electrical industry, the new owner would be in an excellent position to apply its know-how to the promising field of industrial automation (automatic factories).

▶**Dominant Position**—Hughes Aircraft has achieved within the brief span of five years a dominant position in the air weapons system field, Gen. Harold L. George (USAF Ret.) told AVIATION WEEK. Gen. George is company vice president and general manager.

The complex radar fire control systems used on all of the USAF's current crop of interceptors—F-86D, F-89D, and F-94C—were developed and produced at Hughes. HAC systems also are used on one of three current types of Navy all-weather fighters, McDonnell F2H-4, and on the new Canadian CF-100 built by A. V. Roe.

Using a new rocket salvo technique developed by Hughes, these fire control systems will give our interceptors a high kill probability against an enemy bomber, Gen. George says. Without such systems, the kill probability would be very low, he adds.

▶**Advanced Work**—Hughes already is developing an advanced fire control system for the USAF's new crop of supersonic interceptors, first of which is the Convair F-102. These airborne systems will tie in with elaborate ground radar networks and computers to guide the interceptor automatically to the vicinity of the target. From there, the airborne fire control system will take over and automatically maneuver the interceptor into position for the kill.

These new systems will fire the Hughes-developed Falcons, a small air-to-air guided missile that Gen. George thinks will raise the kill probability much higher. For security reasons, he would say no more about the Falcon or its current status. However, the new Hughes missile plant at Tucson, Ariz., is evidence that the Falcon program is not only successful but well advanced.

HIGH OUTPUT is emphasized in this view of Hughes final system-test line.

▶**Mushroom Growth**—In five years, HAC has mushroomed even by aircraft industry standards. Its annual sales top by three to four times those of the parent organization, Hughes Tool Co. In 1948, HAC's avionics research and development staff numbered 108, "including secretaries and two cats," according to C. B. Thornton, vice president and assistant general manager.

Today the Hughes research and development lab has more than 4,000 employes, of which more than 1,200 have professional degrees. More than half of this 1,200 have had at least a year of graduate work and one in 10 is a Ph.D. There are another 100 engineers outside the lab in manufacturing and liaison activities.

Total employment in avionics work has grown from an estimated 750 in 1948 to over 16,000 today. Factory and lab space total 2.4 million square feet, including the Tucson plant.

▶**Technical Talent**—The electrical industry has been aware of HAC's growth despite the operation under the misnomer of an aircraft company. Hughes lured some top scientific and production personnel from the old-line companies as it built from scratch. For bait, HAC used high salaries and opportunity for greater responsibility, faster advancement. (Hughes says a survey by an outside firm showed its salaries are not out of line with the industry for positions of comparable responsibility. However, the men at Hughes are usually 5-10 years younger than their blue-chip company counterparts.)

AVIATION WEEK was the first magazine to have a reporter in Hughes Aircraft Co.'s huge Culver City, Calif., plant after a recent company decision permitted disclosure of details on Hughes' rapid development. The accompanying story by Avionics Editor Phil Klass, who visited the plant, tells how that growth occurred.

Not all who came to Hughes stayed. There were, and probably still are, growing pains that caused some to leave. Others succumbed to offers from other West Coast electronics industries. Despite this and the nationwide shortage of engineers, HAC has assembled a top-notch array of technical talent.

▶**The Skeptics**—In the early days, there were many who doubted that Hughes could buy a heterogeneous collection of experts from a variety of companies and weld them into a going operation.

At the time, skepticism seemed justified by the technical complexity of missile and fire control work Hughes had undertaken and the production schedules it faced.

A tour of the well-laid-out plant here, which is turning out interceptor fire control systems at the rate of several million a month, should convert the most stubborn skeptic. General Electric, RCA and several other top manufacturers have sent teams to see and learn, plant manager R. B. Parkhurst says.

▶**Eager Team**—Credit for HAC's present position appears to belong to the management team which Howard Hughes brought together from various parts of the country—some from the military services and some with civilian background. They were mostly young men eager to try new ideas in research, manufacturing and organization.

Hughes gave these men a generous supply of dollars and the opportunity to put their new ideas to work.

▶**Management**—Under Hughes, who is president of the company, the next in line of authority is Gen. Ira C. Eaker, (USAF Ret.), senior vice president, then Gen. George and Thornton. Thornton, who joined HAC in 1948, previously was director of planning at Ford Motor Co. and helped in its post-war reorganization.

Directly under Thornton is Dr. Simon Ramo, a top electronics man who spent 10 years in research with General Electric. Ramo came with Hughes in 1947 and is now vice presi-

dent-operations. V. G. Nielson, who joined Hughes in 1949 and became director of administration in 1951, is a former assistant dean of the Harvard Business School. His academic background had been broadened by several administrative positions in industry.

Dr. Dean E. Wooldridge, vice president in charge of the R & D lab, came from Bell Telephone Labs in 1946.

▶ **Innovations**—Hughes officials showed and described to AVIATION WEEK some of their innovations. One is designed to cut the 4-6 year period normally required to develop and get a complex fire control system into production. The penalty for so long a gestation period is that the equipment may be outmoded when it goes into use.

HAC uses a technique called "telescoping research and development" to speed up the cycle. It involves close project coordination and calculated risks in the release of drawings. The company also has designed its factory production lines to permit rapid introduction of design and circuit changes, plant manager Parkhurst says.

Another innovation is widespread use of precision inspection gages and instruments on the factory floor to enable machine tool operators to check their own work on the spot. In this way, a machine or tool slipping out of tolerance is detected and corrected after the first defective piece is turned out instead of waiting detection at a distant inspection point.

Despite the close tolerance work involved in fabricating radar and computer parts, Hughes has little spoilage, Parkhurst says. He attributes this largely to HAC's on-the-spot inspection. (A final or regular inspection follows that by the individual worker.)

▶ **Bell Labs of the West**—Ph.D.'s held by two of five HAC vice presidents show the importance of research and development in the organization. The company reportedly has spared no expense in equipping its R & D lab with research tools and has tried to create an atmosphere conducive to research. One competitor dubbed the HAC facility "The Bell Labs of the West Coast."

Evidence of the academic atmosphere is a 48-man advisory council representing all sections of the R & D lab. The council meets weekly to discuss lab problems and to act as a sounding board for new company policies, Nielson told AVIATION WEEK.

More than 20 aircraft bailed to Hughes for flight test purposes see to it that lab personnel never forget the end purpose of their research. These aircraft, many of them jets, operate from a runway adjoining the lab buildings.

▶ **Commercial Field**—Gen. George is confident the military will keep a strong research program going in

Howard Hughes

weapons systems, even if international tension eases. He says the company intends to broaden its base by moving into the industrial electronics field. It already has taken the first step.

Hughes is marketing germanium diodes, originally developed for its own use, and has set up a separate manufacturing and sales organization to handle the product. (Responses to several AVIATION WEEK inquiries to companies using Hughes diodes indicate the device has established an excellent name.)

HAC is active in this solid-state physics field, Gen. George says. He indicates that Hughes soon may enter the commercial transistor field.

The company's missile and fire control work have plunged it deeply into the fields of servo mechanisms and high-speed digital computers. Gen. George expects industrial automation will offer a large future outlet for this know-how.

▶ **Other Activities**—During expansion of the avionics department of Hughes Aircraft Co., there was growth also in the Aeronautical Division, under the direction of Rea Hopper. Major recent product of this division is the XH-17 helicopter, largest in the world. This Air Force project has been termed a prototype of heavy duty, short-range helicopter designed to lift and deliver such military equipment as artillery, tanks, trucks and personnel not always accessible to other types of aircraft and transportation. XH-17 has been flown and is now in test flight stages.

In the field of armament, the Aeronautical Division is producing and continuing development of ammunition feed chutes and booster drives.

There is speculation within HAC that any sale of Hughes' avionics interests will not include the Aeronautical Division. These observers feel that Hughes wants to retain facilities for experimental airplane and helicopter work."

Defense Earmarks 60% for Air Power

Air power will get 60 cents of every defense dollar in the revised 1954 budget, despite a proposed cut of $5 billion from Air Force requests, the Administration says.

President Eisenhower said last week that more than 40% of all defense money will go to the Air Force. He said that on June 30, USAF will have more than $40 billion available.

About 20% of defense funds asked for fiscal 1954 will go for Naval air power. That is approximately half the entire Navy budget.

▶ **Heaviest Outlay**—The President said the heavy investments in air power represent "and will continue to represent" the heaviest single annual outlay of the government.

"It is my conviction that our developing program—under constant review and study—will result in a steady growth in the size and efficiency of the air defense, until we have attained an adequate level of security."

▶ **Destructive Power**—The Administration is placing major emphasis on air power, he said, because it daily "becomes a more important factor in war."

Mr. Eisenhower asserted that security cannot arbitrarily be defined as the simple equivalent of a specific number of aircraft or air wings.

"For example: Today three aircraft with modern weapons can practically duplicate the destructive power of all the 2,700 planes we unleashed in the great breakout attack from the Normandy beachhead.

"Clearly every technological advance profoundly affects this problem of air power—including the development of missiles now in production. Similar advance in civil defense will help shape the nature and size of our air forces."

CAA Names Howell New Airport Director

Appointment of Herbert H. Howell, as director of Civil Aeronautics Administration's Office of Airports was announced last week by administrator Fred B. Lee, confirming AVIATION WEEK's forecast (May 11 p. 13) that Howell would succeed Phillips Moore in the top airports post.

Lee says Moore will be assigned as special advisor to the administrator to assist in long-range planning of the airport program.

Howell had been director since January 1951 of the Washington supplemental airport project.

Airline Subsidy Budget

(New CAB estimates*)

	Fiscal 1953	Fiscal 1954	Change
International	$44,062,000	$44,665,000	+1%
Domestic	35,264,000	34,926,000	−1
Total	$79,326,000	$79,591,000	
Domestic breakdown:			
Domestic trunk	$4,444,000	$3,708,000	−16%
Local service	22,259,000	22,471,000	+1
Territorial	8,561,000	8,747,000	+2

Note: Excludes helicopter mail pay, which CAB calls service rather than subsidy.
*Estimated by CAB in March, 1953, at Post Office Department request.
Source: Hearings of House Appropriations Subcommittee on Post Office budget.

P. O. Wants to Cut Airmail Rates

By Lee Moore

Postmaster General Arthur Summerfield wants to cut airline mail-rates drastically by taking over the rate-fixing authority of Civil Aeronautics Board. Major impact of this plan would hit the 10 non-subsidized trunk airlines. Subsidized air carriers would get increased subsidy if mail rates were reduced.

Airlines will fight the Post Office Department proposal. They will back a compromise subsidy separation program now in final drafting stage at the White House.

Washington observers believe Summerfield will go along with the simpler separation program because it automatically would relieve the Post Office of an estimated $80 million in subsidies slated for payment to U.S. carriers in fiscal 1954. CAB would pay it instead.

The more radical plan of the Post Office would require amendment of the Civil Aeronautics Act allowing postal authorities to negotiate mail rates directly with the individual carriers, as they already do with railroads. The Postmaster General told congressmen the present system forcing the Post Office to buy airline transportation without any price authority is "impossible."

Summerfield and Assistant Postmaster General-Transportation John C. Allen revealed their airline mail-rate plan in hearings before House and Senate Appropriations Subcommittees.

► **Compromise Likely**—There's little chance of the Post Office program going beyond the thinking stage during this session of Congress. But Summerfield and Allen mean business. Their determination to force the issue is likely to sway airlines to compromise on the subsidy separation plan under study at the White House.

The White House program may well be enacted into law this year in the form of an executive reorganization plan. This does not require positive action by Congress. The President would propose the program, and it automatically would become an act of Congress within 60 days, unless vetoed by both houses.

Previous subsidy separation plans were introduced as new bills before Congress. They never reached a vote.

► **Post Office Plan**—Under the plan introduced by Summerfield and Allen, the Post Office would:

- **Negotiate rates** directly with airlines.
- **Set lower mail rates** ranging from 25 cents to 40 cents a ton-mile, compared with today's CAB minimum of 45.
- **Increase overall volume** by shipping some surface mail by air.
- **Cut helicopter and other mail service** considered uneconomic.
- **Leave subsidy to CAB,** which would ask separate annual appropriations.
- **Pool outgoing mail loads** for shipment in greatest bulk at lowest rate—as in commercial freight forwarding.
- **Treat CAB** as it does the Interstate Commerce Commission. Summerfield told senators: "We certainly should have the same privilege with the CAB as we do with the ICC."

► **Free-Market Plan**—This reference confused some observers. Here is what it means:

The Transportation Act of 1940 authorized the Post Office to contract directly with railroads at rates above and below those set by ICC. The commission sets a single car-mile rate that takes no cognizance of length of haul, giving longhaul railroads authority to undercut the unit rate and permitting some favorably situated shorthaul roads to demand rates higher than the ICC level.

Post Office likes this free-market plan of buying transportation at negotiated rates rather than acting as rubber stamp for CAB at a cost of $136 million total airmail pay estimated for fiscal 1954—$80 million subsidy and $56 million service.

Mail-carrying airlines fear the new Summerfield plan would cut rates to cost and even below on some operations, because the Post Office would bargain them against each other to obtain minimum bids and would try to get nonskeds and airfreight companies to underbid the certificated airmail carriers.

Summerfield and Allen told congressmen they have not figured out the exact affects their plan would have, but the congressmen drew them out on some aspects.

► **Post Office Testimony**—The Postmaster General introduced the basic idea of his plan, then passed the ball to Allen. Here are the main points brought out:

- **Set own rate.** Summerfield said, "We propose to submit to Congress for legislation which will permit the Post Office Department to negotiate the purchase of air transportation."
- **Lower cost.** Sen. Harley Kilgore asked for the real cost of airmail service. "We do not have completed costs," Allen replied, "but there is certain information that . . . airmail is being charged considerably more than other mediums of transportation."

In House subcommittee testimony, he enlarged on this for chairman Gordon Canfield: "The lowest service rate the CAB has given us today is 45 cents a ton-mile, and private industry and individual shippers can move airfreight for 25 cents a ton-mile. The rates prescribed for air express . . . average around 36 or 38 cents a ton-mile. I am not convinced that it costs the airlines less to move air express than it does airmail."

- **Cutting the rate.** The postal transportation chief told Sen. Kilgore: "We think there are many moves where we could advantageously pool our volume together and make it more attractive to the airlines to make it less expensive to the Post Office Department to handle,

Airline Mail Pay Increases

(Fiscal years, in millions)

	1951	1952	1953	1954
Subsidy	$76.8	$71.4	$79.3	$79.6
Service	44.5	51.5	53.5	56.3
Total	121.3	122.9	132.8	135.9

Source: CAB administrative separation of subsidy from mail pay, October 1952 revision for 1951 and 1952; March 1953 revision for 1953 and 1954 (includes 1951 and 1952 figures without change).

which in turn would mean lower rates to the Post Office and a better movement to the airline."

• **More volume.** Summerfield said many passenger trains have been taken off service during the last several years. "We have to provide another way of moving the mail," he told the subcommittee. "You either have to do it by truck on already congested highways, or you can put it in the air. . . . That is why we think delivery of mail by air deserves a good look-see."

• **Cut helicopter service.** In response to a query by Rep. J. Vaughan Gary on helicopter mail service, Allen said: "I am convinced there are instances where the service of the mail is not improved by the existing helicopter service." But he added that cutting the volume might increase unit cost on the remainder: "If we take that work away from the helicopter people and move it by motor truck at a lower cost, there is some question as to what affect that has on the overall rates we pay."

He concluded by urging "material curtailment" of copter mail service but said "it might be logical to keep this helicopter situation in the picture to some degree with this congestion becoming more severe as it is in these larger cities."

Canfield approved Allen's last statement but came to the rescue of the helicopter service: "I envision the time when helicopters may be a godsend to us in serving the fringe cities and towns around New York in the distribution of mail."

He said that in an atomic attack, "the Post Office helicopter men would be the men that we would want on the job. . . . What I have been opposed to is using the Post Office Department as a guinea pig to develop helicopters." He suggested Defense Department pay for experimental copter development, not the Post Office.

• **Contract mail routes.** Canfield asked if Allen "has considered using airline contracts as air 'star routes' between major cities?"

"The present law," Allen replied, "would prohibit us from using air movement where other movements were available for surface transportation." But he said: "I really believe there are places today where the airplane can do a better job than can the other mediums. . . . There should be a greater latitude to (choose the most efficient carrier) to the extent that private industry does."

▶ **Post Office Deficit**—Summerfield told congressmen the elimination of airmail subsidy from his budget was the most important item on his list of recommendations.

Sens. Joseph McCarthy, chairman of the Appropriations Subcommittee, Everett Dirksen, Burnet Maybank and Warren Magnusen congratulated the Postmaster General on his active plan to do that. Sen. Kilgore added a complement on Summerfield's plan to take over rate-making from CAB, saying: "I do not even like the ICC fixing parcel post rates."

Summerfield introduced his total budget by noting that his deficit for fiscal 1954 was $150 million less than the one his Democratic predecessor proposed to the Budget Bureau last Sept. 12 and $72 million less than the request in the Truman budget.

The 1954 Post Office deficit totals $587 million. It includes $80 million of airline subsidies.

Sen. McCarthy said airmail would show a big profit for the Post Office if subsidy were taken out. He pointed out that the 1952 airmail deficit was $54 million. If the $71 million airline subsidy of that year were eliminated, the Post Office, by its own cost allocation figures, would have shown a $17-million profit.

Tigers, Slick File Merger Arguments

Flying Tiger Line and Slick Airways have filed merger application exhibits with Civil Aeronautics Board, claiming they would have doubled their last year's combined $1,151,396 profit had they been operating as a single carrier.

The estimated profit, excluding non-operating income, was based on assumed revenues of $38 million, slightly more than their actual combined $37,872,411. Cost savings would have made the big difference, they argue.

If allowed to merge, they claim they could gross more than $45 million in 1954, with substantial increase in net profit.

Other savings claimed:

• **Combined operation** would increase load per plane flown, widening the all-important spread above break-even load factor.

• **Stronger assets.**

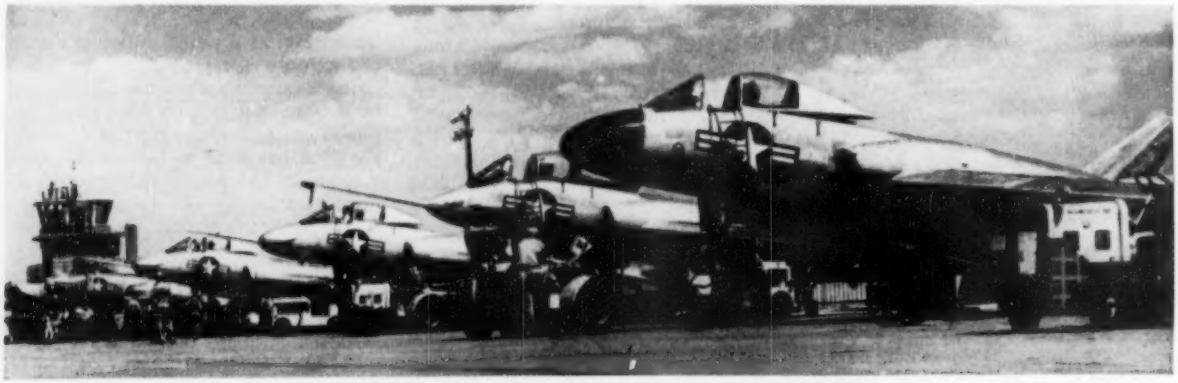
• **Reduced overhead.**

Hearing of the merger application is slated for June 1. CAB denied various motions of consolidation by transcontinental competitors, on grounds they would delay the proceeding.

New Convair Chairman

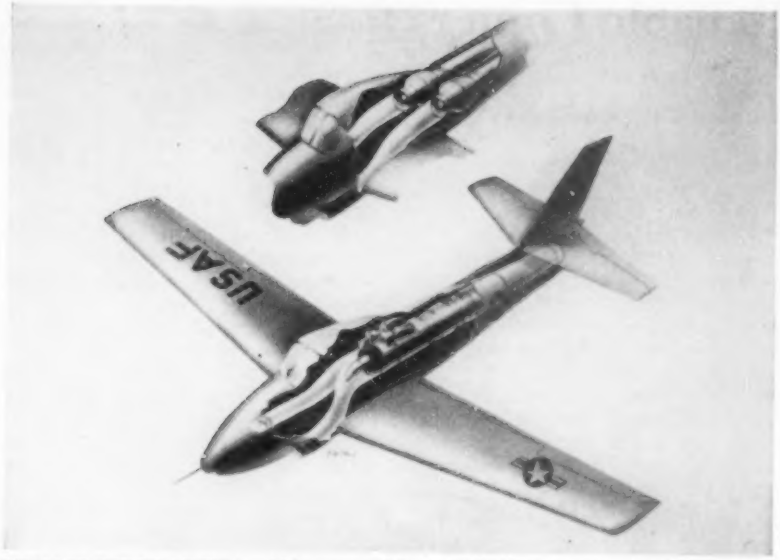
John Jay Hopkins, president of General Dynamics Corp., has been elected chairman of the board of Consolidated Vultee Aircraft Corp. He succeeds Floyd B. Odlum, who relinquished control of Convair when he sold a 400,000-share block to General Dynamics.

Before he retired, Odlum reported to the board that Convair net profits for the first quarter of this year totaled $1,761,278, an increase of approximately 21% over the same period of 1952. Sales were $96,584,213, compared with $86,586,144 last year.



CHANCE VOUGHT LINES UP ITS CUTLASSES

This lineup of new Chance Vought F7U-3 Cutlass Navy fighters includes the largest number of the planes shown in any photo heretofore released. Of particular interest is the nose on the second plane from the right, which differs sharply from the other Cutlasses. The company has at least two versions of the Cutlass in production at its Dallas, Tex., plant: the F7U-3 carrier-based fighter and the A2U-1 ground support model. Specified engines for the Cutlass are Westinghouse J46s.



RYAN 59 JET TRAINER could be powered by a single Allison or two Marbores (inset).

Ryan Reveals Jet Trainer Design

Initial details have been obtained of Ryan Aeronautical Corp.'s first military jet trainer design.

The project, designated Model 59, was one of the entries in USAF's recent trainer design competition, hotly contested by seven manufacturers who submitted 14 different proposals. Winner of a Phase 1 contract for preliminary engineering and a mockup was Cessna Aircraft Co., Wichita, whose entry was first detailed in AVIATION WEEK (Jan. 12, p. 15).

► **Interchangeable Engine**—The Ryan 59 design study features two different and interchangeable powerplant configurations: One involving a single gas turbine, the other two smaller jets with separate tailpipes mounted one above the other.

The single-engine version provides for an Allison 520-C1, a pure jet model of the T38 turboprop developing 1,870 lb. thrust at sea level and with a specific fuel consumption of .927 lb./lb. thrust/hr. The 520-C1 is being readied for production for the Navy.

The dual-engine 59 is planned to take Turbomeca Marbore 351 engines of 880 lb. thrust each. These powerplants are being built under license in the U. S. as the J69 by Continental Aviation & Engineering Corp. The engines receive air from an intake on each side of the fuselage.

► **Performance**—Design performance with the Allison 520-C1 calls for a top speed of 427 mph. at sea level, 438 mph. at 35,000 ft. and a cruise speed of 329 mph. at 35,000 ft.

Initial rate of climb would be 4,100 fpm. Cruise ceiling is calculated at 40,500 ft. and service ceiling at 42,700 ft. Takeoff distance using flaps over a 50-ft. obstacle would be 1,500 ft., and landing distance would be 2,500 ft. at full gross weight.

Performance figures for the twin Marbore installation estimated a top speed of 410 mph. at sea level and 428 at 35,000 ft. Cruise speed at 35,000 ft. would be 329 mph.

Normal endurance of the Allison-powered model, figured at 2.9 hr. at 35,000 ft., could be increased to 5.16 hr. with 100-gal. fixed wingtip fuel tanks.

► **Simple Construction**—Ryan engineers planned simplified construction for the Model 59. The structure would be made up of six major assemblies: the forward fuselage, aft fuselage, wing center section, outer panels, wing tips and tail assembly. Four bolts would tie the forward and aft fuselage sections together, allowing easy disassembly. The continuous wing center section is attached to the fuselage by four bolts.

Ryan 59 specifications include wing span of 38.4 ft. and length of 28.04 ft. Normal gross weight is estimated at 5,992 lb. or 7,455 with tiptanks; empty weight would be 3,700 lb.

CAA Merges 2 Airways Divisions

Civil Aeronautics Administration last week cut and consolidated two federal airways divisions—Establishment Engineering and Maintenance Engineering. Administrator Fred B. Lee estimates the merger will save $100,000 a year.

Functions of installation and maintenance already were combined in the field as the "Facilities Division" of each region. But Washington planning, contracting and operation functions were separate. New combined Washington Division probably will be called the "Airways Engineering Division."

Chief of the new division will be Peter Caporale, former chief of the Establishment Engineering Division. Henry Metz, former chief of the Maintenance Engineering Division, will become Caporale's deputy.

AF Stratojet Flies 12,000 Mi. Nonstop

A sweptwing Boeing B-47B Stratojet bomber has flown more than 12,000 mi. nonstop in 24 hr. with three aerial refuelings, demonstrating its ability to perform an intercontinental long-range mission, Strategic Air Command disclosed last week.

The flight, breaking all distance and endurance records for jet planes, was made last year over southern and western parts of the nation by an Edwards AFB test crew. A dummy 10,000-lb. bomb was dropped midway during the mission to simulate a bombing attack. Other long-range B-47 missions recently were reported following a 1,000-hr. accelerated tactical test program by Boeing crews (AVIATION WEEK Apr. 27, p. 17).

Lt. Col. Russell E. Schleeh, commander of the 12,000-mi. flight, also had commanded the unofficial 1949 transcontinental record flight of the XB-47 from Larson AFB, Wash., to Andrews AFB, Md., which averaged 607 mph.

Air Force also announced two other B-47 performances which, together with the long-range flight, reveal the Stratojet is about ready to take its place as the new medium "Sunday punch" bomber of the U.S.:

• A B-47 piloted by Col. Richard C. Neeley made the first jet flight over the North Pole more than a year ago. Presumably additional B-47 polar flights have been made since. The announced flight was from Eilson AFB, Alaska, across the Arctic Ocean, circling the Pole and return to base.

• Two B-47s of the 306th Medium Bombardment Wing, based at MacDill AFB, Fla., flew the Atlantic from Limestone AFB, Me., to Fairford, England, in 5 hr. 38 min., averaging 555 mph. for the 3,120-mi. flight without refueling. Col. Michael N. W. McCoy and Lt. Col. Ben. B. Klose piloted the two-plane formation.

SAC spokesmen announced the B-47 performances at a demonstration at Carswell AFB, Tex., for the Aviation Writers Assn.

Army Aim: More Reliable Copters

Ground Force tells American Helicopter Society it will sacrifice performance for increased dependability.

By Alexander McSurely

Groundwork was laid last week for a new set of rules to evaluate military helicopter performance during important industry-service discussions at the American Helicopter Society forum in Washington.

Army apparently is prepared to take a penalty in maximum performance to gain greater dependability. Air Force and Navy appear interested in the dependability yardstick, but are noncommittal as to acceptance of it.

▶**Army Spokesman**—Brig. Gen. Frank Besson, Jr., acting Deputy Chief of Transportation for the Army, told an industry symposium on reducing helicopter costs that his service was interested in getting increased dependability and cutting maintenance problems and costs, to make the copter more nearly comparable in dependability to trucks and surface vehicles.

"The helicopter is trying for maximum performance all the time. We would like to explore taking a sacrifice in capability to reduce maintenance," he said.

Asked by an industry spokesman how the military would react to a manufacturer who entered a competition showing reduced performance but improved dependability guarantee, Gen. Besson said the Army would consider it very carefully. He pointed out, however, that the Army has been buying helicopters for itself only since last November and that Army Transportation Corps is exploring all ways of getting copters more suitable for its needs.

▶**Other Services**—Officers representing the Navy and Air Force indicated their interest in the proposed new criteria, but would not comment.

However, the symposium discussion shows a significant new trend in military thinking, particularly when it is considered together with a recent action of the Navy Bureau of Aeronautics:

Navy has asked helicopter manufacturers for a more realistic rating of their powerplants on a basis of continuous operational or cruising power, rather than takeoff power. One example of how this works is the new Bell XHSL-1 antisubmarine copter. Bell now rates this machine's powerplant, a Pratt & Whitney R2800 at only 1,900 hp. for takeoff, although that engine in some transport plane installations is rated at 2,500 hp. with water injection for takeoff.

▶**Cost Reduction**—As for the original subject of cost, industry panel members agreed there is no easy road to reductions until production volume mounts well above current levels.

▶**Douglas Speaks**—Keen interest of the military services in the helicopter is continuing, Air Force Undersecretary James H. Douglas advised the forum, although only scanty provision is made for helicopters in the "interim" economy defense budget.

"This is cause for concern, but not a disaster," Douglas said. He cited numerous instances of effective military use of the helicopter in Korea, added that the three services are "unified in praise of the helicopter and in developing it."

▶**Stability Aid**—Of technical papers presented at the forum, most important from the standpoint of immediate application was a discussion by Capt. Frank A. Erickson of the Coast Guard and George G. Spratt of Piasecki Helicopter Corp., on a simple lightweight means of improving stability in normal forward flight.

Tests in four different copters now have indicated that an aerodynamic stabilizer, which receives its indication of position by motion of the helicopter in air, can be linked to a servo system amplifying the changes in airflow. This servo is mechanically connected to the helicopter controls to give improved stability either "stick-free" or "stick-fixed."

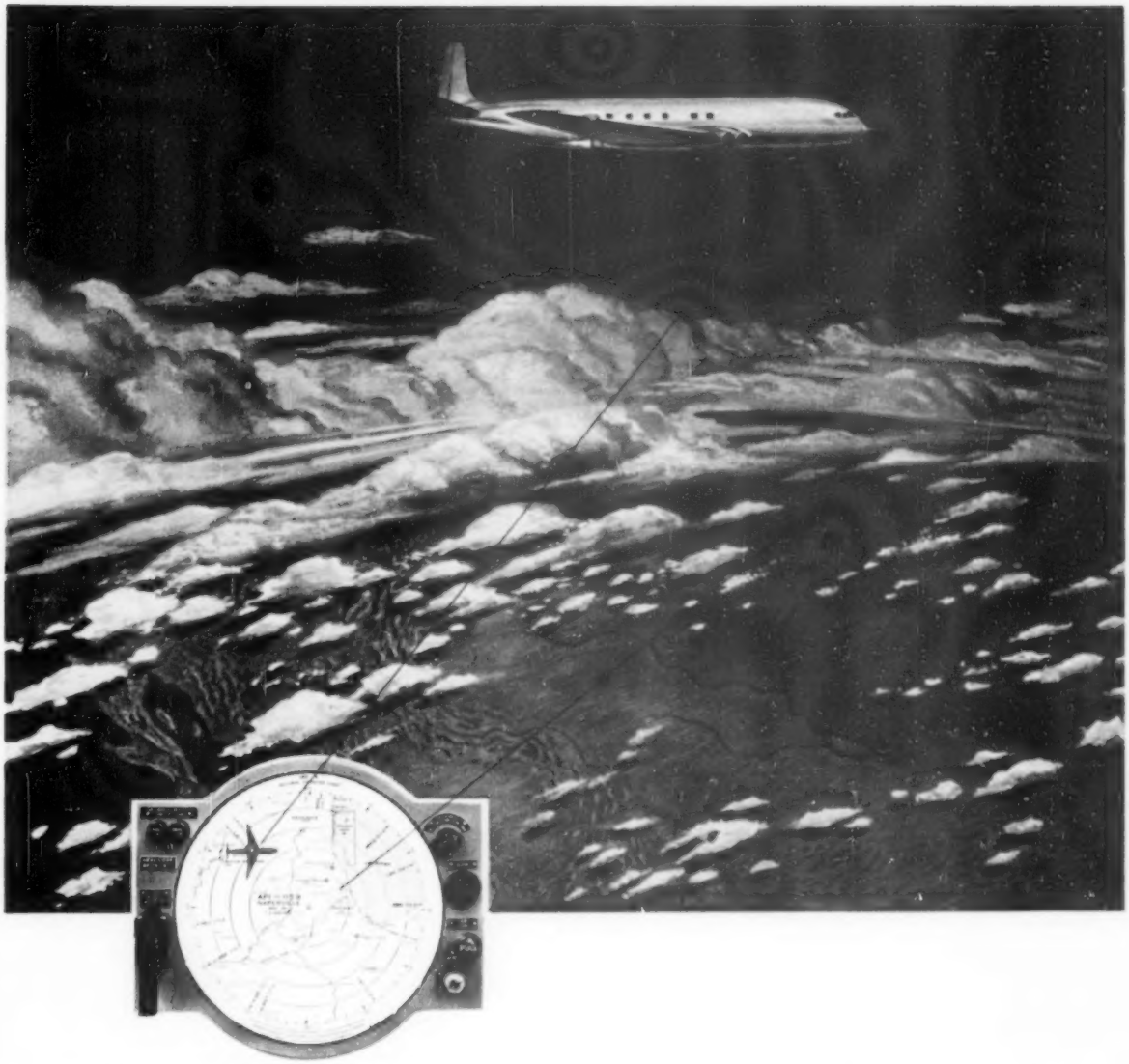
Erickson and Spratt report that the new stabilizer opens up a new area of improvement for the simple utility-type helicopter over present control systems.

▶**Awards Presented**—Raoul Hafner, chief helicopter designer for Bristol Aeroplane Co. Ltd., and inventor of the gyroplane, important early rotary-wing craft, was presented the Dr. Alexander Klemin award for notable engineering achievement in the field of rotary-wing aeronautics.

The Capt. William J. Kossler award for achievement in practical application of operation of rotary aircraft demonstrated in the preceding year went to the U.S. Marine Corps and was accepted by Lt. Col. George W. Herring, former commander of the First Marine Transport Squadron in Korea and at present serving as aide to the commandant.

HILLER STUDIES NEW COPTER STYLES

Artist's conceptions of two large rotary wing designs on the drawing boards at Hiller Helicopters, Inc., Palo Alto, Calif. Top is a "flying crane" configuration powered by two jet units at each rotor tip, while beneath it is a passenger-type craft, using a similar powerplant setup. No performance details have been disclosed by Hiller. The firm in its annual report, from which these drawings were reproduced, states that "jet powered multi-passenger 'flying buses' and huge 'flying truck' helicopters with powerplants up to 4,000 hp. are but two of the future aircraft now in advance planning stage in our Engineering Division." During 1952 the firm, for the fourth straight year, doubled its gross sales over the previous year. Gross sales were $14,399,862 and net income after taxes was $617,059.



Now! Arma puts the plane on the map...

Arma's new Pictorial Computer shows a pilot his exact location and heading, continuously on a projected map—throughout a given flight. Here's how it works:

A film strip containing as many as 700 maps shows the various OBD stations over which the aircraft will pass. During flight, the Arma Computer automatically indicates position and heading of the plane on a TV-like screen. In other words, the Computer shows continuously and exactly where the plane is in respect to the ground, at every moment of flight—regardless of weather, altitude or speed. It automatically tunes to the appropriate OBD frequency, automatically adjusts for scale of map and has provisions for automatic chart changing.

Arma has worked closely with the Air Navigation Development Board and the Civil Aeronautics Administration in developing this Pictorial Computer for use in proposed advanced systems of air navigation and traffic control. For 35 years Arma has worked hand in hand with the Army, Navy and Air Force—and more recently with the Atomic Energy Commission—in developing important military control systems. *Arma Corporation, Brooklyn, N. Y.; Garden City, N. Y. Subsidiary of American Bosch Corporation.*

ARMA ADVANCED ELECTRONICS FOR CONTROL

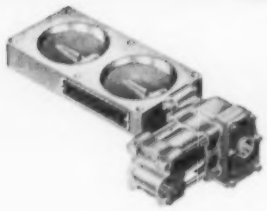
Hydro-Aire

Hot-Air Valves...

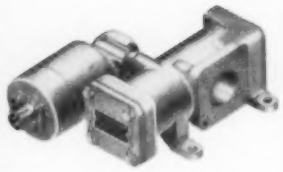
PDQ

A 400% increase in production facilities makes possible prompt delivery schedules of Hydro-Aire's comprehensive line in Hot-Air Valves—among the most widely used in the industry.

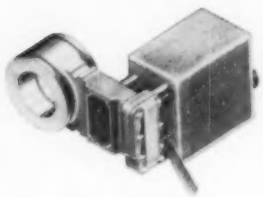
Hydro-Aire Hot-Air Valves cover Three Basic Categories: Butterfly Valves, Gate Valves, Pilot Valves. Motor operated, Pneumatically operated, Manually operated and Solenoid controlled. Duct sizes—one inch to six inches. Duct air temperatures ranging from minus 65° F. up to 750° F. Ambient temperatures ranging from minus 65° F. up to 250° F. A very wide range of operating pressures.



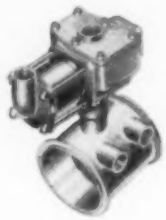
No. 3368



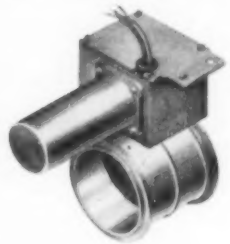
No. 9596



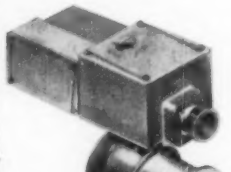
No. 3097



No. 6056



No. 6027



No. 6097

No. 6109

No. 6117

No. 6091

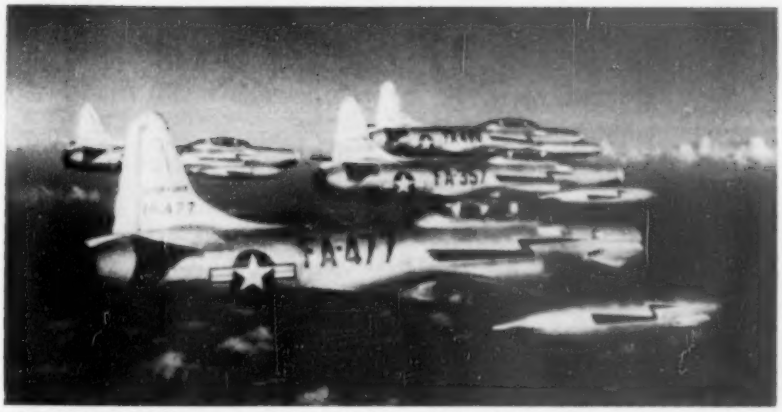
No. 3010

No. 3363

HYDRO-AIRE *Inc.*

Subsidiary of Crane Co.

3000 Winona Avenue · Burbank, California



LOCKHEED F-94Bs, because of their highly classified avionics gear, have seen only limited combat service. This policy has had detrimental effect on pilot morale.

The Air Lessons of Korea

- **U. S. deliberately passes up chance to test air combat 'Sunday punch,' keeps major weapons under wraps.**
- **But AF evaluates first jet war, learns about aircraft and tactics the enemy may use in next world conflict.**

By William J. Coughlin

Seoul, Korea—U. S., in nearly three years of air warfare in Korea, has learned a few new lessons but has passed up a chance to test many untried air weapons and tactics in combat.

Some observers have compared the Korean conflict to the Spanish civil war. The comparison is not apt. War in Spain, serving as a proving ground for World War II, was used by Germans, Russians and Italians to mature battle tactics, test new tanks and aircraft and season combat forces for the larger conflict which followed. U. S. and its Communist foes have not made similar use of the limited warfare in Korea.

▶ **Opportunity Ignored**—With Communists again in a mood to talk truce, Air Force can look back on almost three years of war, sum up what it has learned.

War in Korea is no testing ground, bears no resemblance to World War III.

"Our mistake," grumbled one high Air Force officer as truce talks approached, "was that we didn't take advantage of this war to test our new stuff. Only in the past few months have we begun to run some experimental equipment through combat. The Commies used the war for a test, why didn't we?"

But U. S. was not alone in ignoring the opportunity for a full-scale combat test. Apparently Red leaders also decided the risk was not worth the gain. Communists did not make an all-out proving ground of Korea. They held their air power north of the Yalu for the most part, ventured south only in limited numbers.

▶ **Deliberate Decision**—Failure of U. S. to take advantage of the opportunity offered by Korea was deliberate. Air Force commanders decided early that the outbreak of fighting in the Far East was to be limited, determined to withhold U. S. Sunday punch for the bigger war that might follow. Decision was in favor of security of new secret weapons and tactics at the cost of passing up a chance to test them in combat.

This decision was modified to a small extent in later stages of the war but, in essence, remained unchanged. Only enough air power was committed to do the job required. F-86 Sabres, for its first-line fighter—discovered that while the MiG-15 was a better flying machine, the F-86 Sabre was a better weapon, could shoot its opponent out of the sky at a rate of 10 to 1.

▶ **U. S. Know-How**—What Air Force learned about the MiG was important for modified MiG types in the transonic range are expected to be the mainstay of the Russian air arm during the next 10 years. American designers at work on heavyweight and lightweight fighter aircraft, as well as bombers, know more about possible opponents for their planes as a result of the Korean war.

Complex equipment was praised when it worked, thoroughly damned when it failed. Reliability, it turned out, was the key to the question of complexity. But to keep a complicated

Perfection in Reflection

Rigidly Tested

STRATOGLO

A Superior Metal Polish

Specifically developed by FINE ORGANICS to meet the exacting requirements of the Aviation Industry.

approved under MIL-P-6888

STRATOGLO

PERFORMS INVALUABLE SERVICE ON

- Aircraft Surfaces
- Exhaust and carbon stains
- The removal of heavy corrosion
- The cleaning of fuselage, 95% of reflectance is retained 24 hours after application.

STRATOGLO

is completely free from cyanides and will not stain, discolor or attack aluminum clad panel . . . non-flammable, non-combustible.

STRATOGLO

repeat orders reflect its immediate acceptance wherever it is tried.

OTHER FINE ORGANICS' SUPERIOR AVIATION CHEMICAL PRODUCTS MEETING AIRCRAFT SPECIFICATIONS—

designed to maintain the high efficiency and time saving requirements of a fast moving industry.

STRATOFROST · STRATOL E
STRATOWASH · STRATOPHOS A
STRATOBRITE · STRATOGEL
STRATOTAB · STRATONOL

Our complete research staff and facilities are ready to cooperate with you on all your Aviation Chemical problems. At the present time we are serving the Navy Air Force, Navy Ordnance and the Army Medical Service.

TECHNICAL FIELD SERVICE AVAILABLE ON REQUEST. Write for Complete Information—

AVIATION INDUSTRIAL DIVISION

FINE ORGANICS, inc.

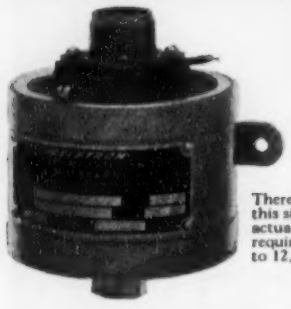
211 East 19th St. · New York 3

Eliminate *Chances* **of failure!**

As airplane performance improves, and components become more reliable, it is evident that these advancements have been accomplished by reducing or eliminating chances of failure. In this quest to remove all possibility of failure, Meletron has been an active participant. Today our instruments are accepted by every major aircraft manufacturer.

MELETRON® CORPORATION

930 NORTH HIGHLAND AVENUE, LOS ANGELES 38, CALIFORNIA



There is available today, from this single source, a pressure actuated switch for every requirement from zero absolute to 12,000 psi gauge.

J. M. WALTHEW CO., Boeing Field, Seattle. THOMSON ENGINEERING SERVICE, 708 Hemphill St., Fort Worth and 732 So. Broadway, Wichita. ROUSSEAU CONTROLS Ltd., Montreal Airport, Dorval, Canada. W. M. HICKS & J. A. KEENETH, 29-27 Forty-first Avenue, Long Island City, New York. JOSEPH C. SORAGHAN & ASSOCIATES, 1612 Eye St., Northwest, Washington 6, D.C.

example, probably would not have gone into combat if older jets and prop-driven fighters could have done the job. They could not, because the Communists decided to use the MiG-15.

▶ **Depleted Air Power**—It was like a chess game where players feel each other out by sacrificing smaller pieces, while holding main strength in reserve. The Red advantage that gave U. S. air commanders the shakes during the past year was this: The Communist reserve was only a few miles north of the Yalu, within easy striking distance of South Korean bases. U. S. reserve was in America.

There was, of course, another reason for the decision: When Korean war erupted in June 1950, American air power was depleted and a full commitment in Korea would have left U. S. exposed at other spots. Even as U. S. air strength grew, global commitments required much of it elsewhere. Thus, as truce approached, less than one-fourth of potential American air power was in the Far East. Air Force, while sparring in Asia, was not letting down its guard along U. S. borders and in Europe.

There was one more reason: War in Korea first whipped like a yo-yo up and down the length of this devastated land, then settled into a trench warfare reminiscent of Word War I. By the time the U. S. was in a position to commit some of its more advanced air weapons, there was no need for them. Outmoded B-29s and B-26s, taken out of the mothballs in which they were placed after World War II, were adequate for the task at hand. Targets in North Korea were scarce, and a diplomatic decision had placed Red bases north of the Yalu River out of bounds. Communists did not use their full air power; thus a handful of American jet interceptors could hold air superiority.

▶ **First Jet War**—What then did the U. S. learn from three years of this limited air warfare on a remote Asiatic peninsula?

It learned its biggest lesson in MiG Alley, the air space over that narrow strip of land in North Korea between the Yalu and Chongchon Rivers. It learned how the MiG fights, both in performance and tactics.

For this was the only "new" war in Korea—the first all-jet aerial warfare. Here were born the first jet aces, names like Davis, Low, Jabara, Baker, to mention but a few.

U. S. combat pilots found bitterly that they still were looking up at the enemy, that the day has not yet dawned when the American fighter pilot can look down at his foe. The MiG had a very definite altitude, as well as rate-of-climb, advantage.

But Air Force—experimenting with the design, gunsight and armament of

Remington Rand Methods News

Simplified, visible production control for maintaining schedules

What's the status of any (or all) jobs in your plant? What assemblies, parts, machines or manpower will you need to maintain schedule. What are the delivery dates? These *facts*, with complete supporting data can be available *instantly* in one simplified, visible record—SCHED-U-GRAPH.

SCHED-U-GRAPH completely centralizes *all* the necessary information for effective production control. There's no digging in statistical reports, tub files, registers or card files. No hurried phone calls. Everything you need is conveniently charted, up-to-date and instantly accessible. SCHED-U-GRAPH so simplifies production control that any supervisor, or even a clerk, can answer *any* question about *any* job at *any* time.

Can SCHED-U-GRAPH help keep *your* production on schedule? We believe it can. And to prove our point, and to give you further information about this flexible, convenient control, we have prepared a case history folder which explains how Tinker AF Base *simplified* production control with SCHED-U-GRAPH. This four-page certified report explains how this huge Air Force Depot uses SCHED-U-GRAPH boards to maintain full control over such diverse operations as: An aircraft assembly line three-quarters of a mile long, a series of shops for repairing and manufacturing parts and accessories, and a network of administrative offices.

Let us send you this complete report. You'll quickly see how SCHED-U-GRAPH can offer *your* business, no matter how large or complex, the same convenient charting of job statuses, item by item, with integrated full supporting data in one easy, accessible record. Ask for **Certified Report #795.**

Portion of SCHED-U-GRAPH installation at Tinker AF Base. Each board is 48 inches high by 44 inches wide and carries 100 visible file pockets. Fiber Guide Wheels permit the board to be raised or lowered for reading or posting.

Tabulating machines prove a boon for medium-sized plants

You don't have to be a giant of industry to realize important savings through the use of punched-card tabulating equipment.

One west-coast tool manufacturer, with 675 employees, centered all its machine hours, labor, sales analysis, payroll and special reports in *one* 5-clerk department, thanks to the efficiencies of punched-card procedures.

What were the savings? In sales analyses alone punched cards gave them a report that previously took 37 days, *in the amazingly short time of 3 days!* Payroll preparation, production control, labor distribution, efficient inventory, even income tax returns for employees were handled with similar efficiencies in time and expense. In the words of their chief accountant: . . . "it would have been difficult to operate with anything like our present efficiency, without these economical and *complete* production sales and general accounting controls." See **Certified Report 804.**

15 or more carbon copies at one typing

"One great advantage of the electric machine is the number of clear carbons that can be obtained, particularly for government contracts" writes the President of a Boston manufacturing company. Let us show you how the Electric typewriter brings you dividends of sharp, clean carbons, as well as increased production and distinctive printwork. Write for Case History **RE 8536** and "Take a Letter" **RE 8499.**

How to solve troublesome "peak load" invoicing problems

A manufacturer of electronic equipment writes us: "Since we have been using the Printing Calculator for extension and computing taxes, invoicing has kept pace with shipments, *even during peak periods.*" Read the complete history and learn how this all-purpose machine combines short-cut multiplication, automatic division, high-speed addition and subtraction in one unit. Ask for **folder AC 633.**

Remington Rand

Management Controls Reference Library
Room 1951, 315 Fourth Ave., New York 10, New York

Please circle the literature you desire

CR #795 AC 633 CR 804
RE 8536 Folder RE 8499

Name_____
Title_____
Firm_____
Address_____
City_____ State_____

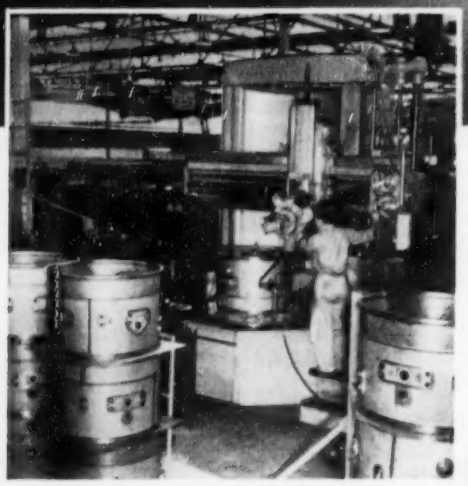
RYAN

Aircraft and Aeronautical Products

Leaders in High-Temperature Metallurgy

for

JET, PISTON AND ROCKET ENGINES



One of the keys to Ryan's leadership in high-temperature metallurgy and ceramics is its modern equipment, including some of the finest high precision machine tools and many of the largest electric resistance welders to be found in the country today. Such equipment, combined with the skills of Ryan research and production engineers, has put Ryan out in front in solving the "hot" problems of the aircraft industry.

Typical of the precision machines found at Ryan is this 64-inch Bullard vertical turret lathe, largest on the Pacific Coast. Ryan uses it and scores of other modern tools for large-scale production of heat-resistant products for jet, piston or rocket engines. You'll find Ryan metallurgists and research specialists in the forefront of high-temperature development work.

Ryan SINCE 1922

Metal Products Division • Jet Engine Components • Exhaust Systems • Rocket Assemblies

RYAN AERONAUTICAL COMPANY • LINDBERGH FIELD • SAN DIEGO, CALIF.

piece of equipment reliable in the field put such a strain on logistic channels that they sometimes broke down. After three years of the Korean war, Air Force still argued the complexity problem—with some diehards not yet convinced that the Air Force's new automatic radar gunsight is any better than "a piece of chewing gum stuck on the windscreen."

▶ **Sticky Task**—In spite of limited commitment of air power to Korea, North American F-86s were not the only new U. S. aircraft to see combat there. F-80s played an early role, then were phased out. Republic F-84s saw extensive service as a satisfactory fighter-bomber.

There was not much new about the fighter-bomber's job even with a faster aircraft. It still was the same sticky task of driving through heavy flak to plaster a ground target. Many pilots, after a fighter-bomber tour, volunteered for a tour in F-86s to find out what the "new" war was like.

Lockheed's F-94B all-weather interceptor saw limited service but, for security reasons, was withheld from combat to such an extent that pilot morale in the outfit deteriorated badly.

Marine's F3D night fighter received high praise for its combat performance but suffered for a time from high operational losses.

▶ **Guided Boomerang**—Navy's carrier-borne jets were assigned the task of ground support, tangled infrequently with enemy aircraft, scored few victories and produced no aces. This drew Navy charges that AF was hogging the war.

North Koreans pumping a handcar down a railroad track were the first victims of a "new" Navy weapon in Korea. As a Navy plane dove on them in what was apparently a strafing run, they pumped into the safety of a tunnel, only to die when the plane followed them in and exploded.

They were killed by a drone Hellcat, television-equipped, loaded with a

HIGH FLYER

Wing Cmdr. W. F. Gibb in the cockpit of a special Olympus-powered Canberra that he flew to a record 63,668-ft. altitude.

NEW! ENGRAVED INSPECTION STAMPS of VINYLITE

Better than rubber * 3 ways

VINYLITE IS ACID-PROOF

Acid etching inks, used for permanent stamping on metal and *all* non-porous surfaces *will eat away at rubber*. Vinylite resists this action — gives longer life by far!

ENGRAVED VINYLITE STAMPING GIVES RAZOR-SHARP IMPRESSIONS EVERY TIME

Heavy base inks will clog shallow rubber stamp faces rapidly. Our deep-molded engraved VINYLITE stamp faces have more than *three* times the depth of ordinary rubber stamps. Markings always remain super sharp . . . an important advantage since this mark is a permanent record of your inspector's approval.

VINYLITE HAS CUSHION-LIKE RESILIENCE

Our VINYLITE molding process includes a timed curing that imparts to this versatile plastic all the elasticity of rubber. Resilient VINYLITE resists abrasive action, conforms to irregular surfaces . . . and lasts much longer!

BEST OF ALL VINYLITE IS ADAPTABLE TO ANY MARKING DEVICE!

We recommend the following for standard inspection procedures:

HOW ABOUT DELIVERY?

We work fast! Any design duplicated, affixed permanently to the stamping device your procedure requires, (or we'll recommend and/or design one).

For FREE samples and Full Information use this coupon

KRENGEL MANUFACTURING CO., INC.
227 Fulton St., New York, N. Y. Tel.: CO. 7-5714

Please send the following:

☐ FREE Vinylite Sample & Price List ☐ Please have salesman call for appointment

NAME .....
COMPANY .....
STREET .....
CITY ..... ZONE .....

Revere takes the **DANGER** out of refueling operations

SINGLE AND DUAL FLOAT SWITCHES

Automatic cut-off control

. . . for single point, high pressure fueling and air to air refueling

Revere float switches are available in many different configurations, some of which include relays to handle heavy electrical loads. Others are designed for complete submersion in fluids. The hermetically sealed switch and balanced float assembly minimizes false alarms caused by vibrations or acceleration forces. These units are unaffected by altitude or other pressure and temperature changes. Switches can be provided with a *single level* or *dual level* system set at factory at any distance between 1" and 18" from the mounting flange.

FOR MORE COMPLETE INFORMATION SEND FOR *FREE* BULLETIN NO. 1200

REVERE CORPORATION OF AMERICA
WALLINGFORD 2, CONNECTICUT, U.S.A.
another precision instrument for aircraft and industry

2,000-lb. bomb and guided from a carrier by a mother plane. Navy's attempt to sell this as the opening of the era of pushbutton warfare (by censoring from news dispatches that the "guided missile" was a drone Hellcat) backfired, drew scorn from the Air Force and a public label of "guided boomerang" for the new weapon.

▶**Strange War**—There was no pushbutton warfare for Air Force bomber pilots, flying B-26s and B-29s. Despite limited experimentation, their task was little different from World War II. At least one postwar bomber saw brief action in Korea. But in general, Air Force withheld its new strength, preferred to expend its old bombers on targets which were hardly worth the effort in any event.

Air Force had to adjust itself to a strange war with odd boundaries. One was the diplomatic barrier drawn at the Yalu River between Manchuria and North Korea. The other was an enemy aircraft that could get "out of bounds" just as effectively by climbing above a Sabre's ceiling as it could by scooting across the Yalu into the Manchurian sanctuary. Fifth Air Force thus fought in a sort of box with the enemy always on the outside, except when the Reds felt like venturing inside.

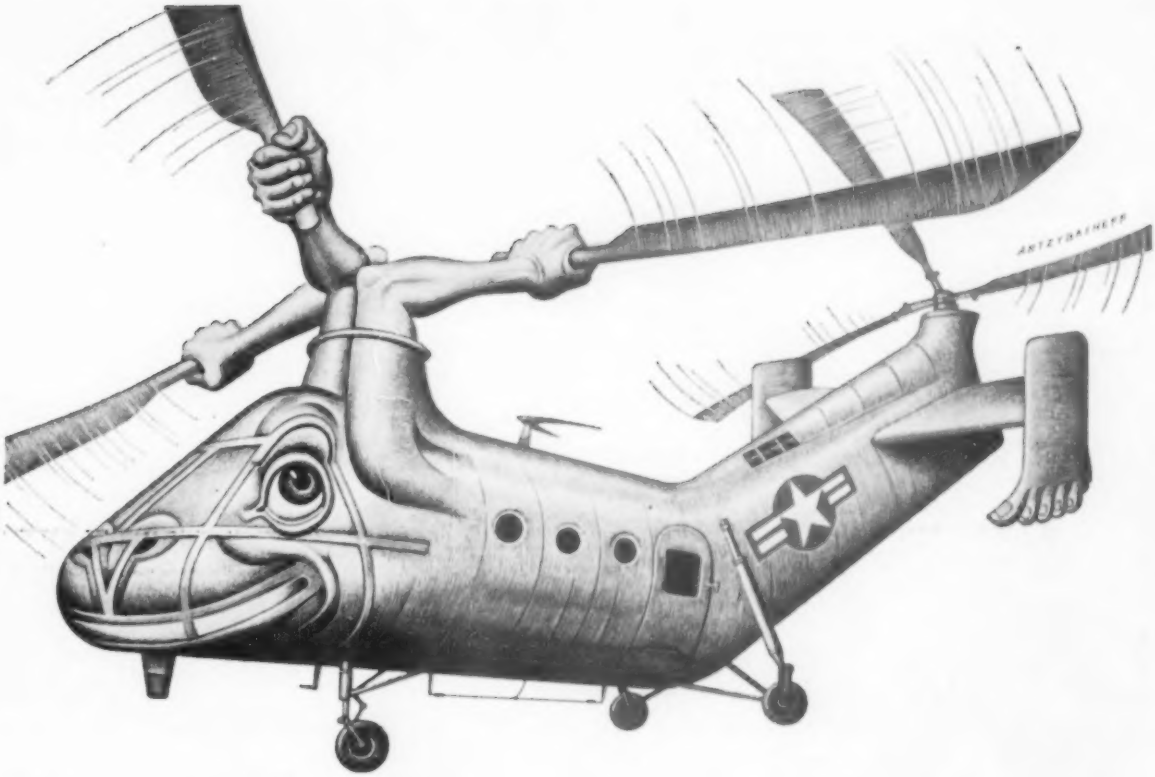
New tactics were required for a war of this sort. Fifth AF made the adjustment, not always easily.

"Operation Strangle," ambitiously presented as an interdiction effort which would prevent supplies from reaching enemy troops at the front, failed to accomplish that mission. Main Communist supply bases were north of the forbidden Yalu border.

▶**Loaded Pistol**—U. S. had another worry. The Communists could crush the box containing Fifth Air Force whenever they decided to do it. Air Force likes to defend rear areas by using offensive strength to keep enemy off balance and far enough away so that he cannot mount an air offensive against U. S. bases. The Yalu River boundary line prevented that. Communists could base their big air fleet within range of South Korea without fear of U. S. attack. Fifth thus operated with a loaded pistol always at its head.

Air Force discovered its new concept of self-supporting wings did not fit neatly into the pattern of Korean fighting, made some organizational changes. Wings contributed maintenance personnel to joint rear echelon maintenance centers set up in Japan, and heavy maintenance was done there. Some wing and group commanders liked the system, others complained of defects. Main complaint was that it kept aircraft out of combat too long. "We could do our own maintenance faster right here," said one group commander.

In another instance, one wing struc-



How a helicopter hangs by its "elbows"

Straight up, straight down, forwards, backwards, or just hovering—the Piasecki "Work Horse" Helicopter's peculiar flying maneuverability rests in its rotor assemblies. It is these flexible "elbows" that adjust the pitch of the 'copter's great blades. Each unit involves more than 625 separate parts. To machine and assemble them, Piasecki depends on Lycoming for precision production.

Lycoming stands ready to assist you whether you have a metal product that needs speedy precision or volume fabrication—or "just an idea" in the rough or blueprint stage. Long famous for its metal-working skill, Lycoming continues to meet the most exacting requirements in a wide diversity of fields, both industrial and military. *Whatever* your problem—look to Lycoming!

More than 6,000 machine tools, a wealth of creative engineering ability and 2½ million feet of floor space stand ready to serve your needs.

AIR-COOLED ENGINES FOR AIRCRAFT AND INDUSTRIAL USES • PRECISION-AND-VOLUME MACHINE PARTS • GRAY-IRON CASTINGS • STEEL-PLATE FABRICATION

LOOK TO LYCOMING FOR RESEARCH FOR PRECISION PRODUCTION

LYCOMING-SPENCER DIVISION, WILLIAMSPORT, PA.
BRIDGEPORT-LYCOMING DIVISION, STRATFORD, CONN.

AVCO MANUFACTURING CORPORATION

For flexible "elbows" —rotor assemblies that control the maneuvers of its H-21 Helicopter—Piasecki looks to Lycoming's precision production

Lycoming-Spencer Division
AVCO Manufacturing Corp.
652 Oliver Street
Williamsport, Pa.

Please send me further information on Lycoming's varied abilities and facilities.

Name_____

Firm_____ Title_____

Address_____

City_____ Zone____ State____

WE MADE A DEAL WITH "FATHER TIME"
SAYS
Marron Kendrick,
VICE PRESIDENT
Schlage Lock Co.
SAN FRANCISCO
THIS IS A SPECIAL RUSH JOB— NEW YORK WANTS THE LOCKS FOR THE S. S. UNITED STATES
...THAT MEANS SHIPPING BY AIR, DOESN'T IT?
FATHER TIME THREW US A CURVE, CHIEF.
WE CAN MAKE IT WITH TIGER AIRFREIGHT— THAT'LL GIVE US EXTRA PRODUCTION TIME.
HERE COME THOSE SCHLAGE LOCKS, JOE.
WITH WINGS, TOO.
UNITED STATES
THE TIGERS TO THE RESCUE, EH, CAP?
HAVEN'T MISSED THE BOAT YET, PAL.
KEY
MAIN ROUTE
CONNECTING ROUTE
Write for free illustrated folder describing Flying Tigers' unique Advance Manifest System.
FLYING TIGERS ... ANOTHER BUSINESS BUILT ON 'CAN DO'
Flying Tiger Line
OFFICES IN PRINCIPAL CITIES • GENERAL OFFICES: LOCKHEED AIR TERMINAL, BURBANK 8, CALIFORNIA • CABLE: FLYTIGER

ture was dissolved entirely and its fighter-bomber group assigned to another wing on the same field to avoid administrative duplication.

▶**Personnel Problems**—Outbreak of the fighting brought personnel problems for USAF. Reserves had not been maintained at a proficient level.

"I had not flown since World War II," said one reserve pilot in an interview. "I was recalled, given 10 hours in an F-80 statewide, sent to Korea, given 10 hours transition in an F-86 and sent into combat. I spent my first 35 missions learning to fly the airplane."

Not only reservists, but many career officers feel Air Force personnel policy needs a thorough overhaul, that recent efforts in that direction have not been successful.

U. S. found itself with other air handicaps also. Wrong logistic decisions were made, had to be corrected. Its radar was inadequate. The war that was not a war seemed to develop many problems not associated with an all-out air effort.

▶**U. S. Gains**—Communists, meanwhile, while not commiting their air power to a full test, still were experimenting. The MiGs improved, both in tactics and performance. Red radar proved excellent. Flak became intense and accurate. These added to U. S. troubles.

But after 34 months of Korean fighting, U. S. also could tote up some things on the positive side of the Air Force ledger:

• **Its air power again is expanding** and progressive, with research and development facilities alert to new combat problems.

• **While not using the Korean War** as a test center, U. S. still obtained valuable combat experience with jet fighter aircraft, held air superiority with those it did use.

• **A large number of fighter pilots** now have jet combat experience and many reservists are up to date in their flying techniques, both in jets and propeller-driven craft.

• **Organizational and administrative** weaknesses that had turned up could now be corrected.

• **U. S. had learned quite a bit** about fighting the type of semi-war so familiar to many countries but completely foreign to U. S. As did other U. S. military men, Air Force leaders discovered that in this war they were playing diplomatic, as well as military roles. It required intense self-discipline and restraint.

Thing to remember is this: Korea is a very small war, must be kept in perspective. As a forerunner to World War III, it hasn't proved much. But, bloody as it may sound, there is nothing like a war, even a small one, to keep an outfit in fighting trim.

Engineers inspect latest models (mock-ups) of G-E air turbine drives—turbo alternator drive left, turbo hydraulic pump right

New G-E Air Turbine Drives Assure Jet Aircraft Reliable Auxiliary Power

Electric and Hydraulic "Power Packs" Can Be Advantageously Located to Improve Performance, Ease Maintenance

RELIABLE ELECTRIC AND HYDRAULIC POWER—under all operating conditions—can be built into your aircraft with G-E air turbine drives. Operated on bleed-air from the engine compressor, these drives employ one of the simplest of power generation methods. Just one efficient, smoothly rotating turbine-wheel is the heart of the drive for the airplane's electric and hydraulic units.

IMPROVED AIRCRAFT PERFORMANCE can result from these advantages of air turbine drives:

1. Decreased system weight and reduced vulnerability because drives can be installed at the most advantageous location for optimum aircraft design.
2. Multi-engine reliability because one engine can supply air for all accessory turbine drives.
3. Elimination of crowded engine compartment in buried engine installations.
4. Reduced drag because engine nacelles can be aerodynamically cleaner, have smaller frontal area.

EASE OF MAINTENANCE is another benefit of air turbine drives. When routine maintenance is necessary, the compact units are easily accessible. Also an entire unit can be removed and a new one put quickly into place, shortening ground time of the aircraft.

For further information on air turbine drives for dependable electric and hydraulic power, contact your nearest G-E aviation specialist or fill out the coupon and send to General Electric Company, Section 210-61, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

MAIL THIS COUPON TODAY FOR *FREE* BULLETIN

General Electric Company
Section A210-61
Schenectady 5, N. Y.

Please RUSH me your bulletin GEA-5870, Air Turbine Drives for Jet Aircraft

For:

..... **Reference Purposes**
..... **Immediate Project**

Name .....
(Please Print)
Position .....
Company .....
City ..... **Zone** ..... **State** .....

MOUNTAIN...dead ahead!

New radar "sees" it through darkness

You are looking at the makings of a crash. But it won't happen. Through the darkness a new Aircraft Radar revealed a mountain range directly in the flight path. Now the pilot is climbing to clear it.

Like a powerful telescope, this advanced-type radar equipment enables the pilot to study obstacles "close-up"—in a choice of five different ranges between 5 and 200 miles. Here is a compact lightweight radar that will readily indicate mountains and near-by aircraft. It can locate thunderheads and other cloud formations—permit the pilot to navigate a safe course. It can map terrains, showing the pilot the salient characteristics of the ground he's flying over. It can help the pilot keep his plane on the desired flight path. It can even be used as a visual check against the landing and approach instruments in his plane.

This new Aircraft Radar, made by RCA for the Navy Bureau of Aeronautics, is another technical achievement worked out in close co-operation with the military to insure U.S. supremacy in electronics. Meet the RCA engineers and field technicians in your branch of service.

RCA **RADIO CORPORATION of AMERICA**

ENGINEERING PRODUCTS DEPARTMENT CAMDEN, N.J.

Air Force Chief

- **Twining will take over during grave AF crisis.**
- **Appointment is military victory over politicans.**

Gen. Nathan Farragut Twining and Lt. Gen. Thomas Dresser White, recently appointed USAF chief and vice-chief of staff respectively, will take over the Air Force during a period rapidly developing into one of the gravest crises in USAF history.

Both appointments are popular within AF and represent a victory for the Air Force against external political pressure exerted on behalf of other candidates.

Appointment of Gen. Twining was forecast, but the nomination of White for the No. 2 spot was a surprise in the face of informed predictions that an officer with more external political support would be favored.

Twining, 56, is scheduled for retirement in October, attaining 35 years service with more than five years as a general officer. However, he will be recalled to active duty to serve the remainder of a two-year term as Chief of Staff.

White, 52, is regarded as one of the ablest senior USAF officers and will be a strong favorite to succeed Gen. Twining in 1955. The postwar history of USAF has seen each Chief of Staff serve a hitch in the No. 2 spot before taking over command.

Gen. Twining succeeds Gen. Hoyt S. Vandenberg, 54, who has been in USAF's top post since April 1948. Vandenberg has announced his plans to retire June 30.

▶ **Pacific Veterans**—Both Gens. Twining and White are West Point graduates and have a rare combination of combat command service and top level administrative experience. They have extensive experience in inter-service, congressional and diplomatic relations and are veterans of Pentagon in-fighting.

The appointments also mark the first rise USAF's top officers whose wartime experience has been primarily in the Pacific theater of operations. Both Twining and White had their first combat commands under Gen. George Kenney in the Southwest Pacific during World War II.

Gen. Twining began his combat career as commander of the 13th Air Force in January 1943 and six months later was named by Adm. William F. Halsey as commander aircraft, Solomon Islands, and given tactical control of all

Photo by Don Downie

Lockheed F-94's in formation

IN LINE

The straight in-line center section stands out on Fletcher tanks. Lighter, stronger and more flexible in size, Fletcher tanks are in line with the demands of defense. The expandable feature of adding "barrels" to make tanks grow in size is exclusive with Fletcher.

CAMLOC is part of the production team that keeps deliveries in line with defense requirements.

CAMLOC fasteners are light, strong and versatile . . . says L. D. Bonham, Assistant Chief Engineer, in charge of all tank projects for Fletcher Aviation. "Our purchases cover over a million Camloc fasteners each year with complete satisfaction to us and our customers."

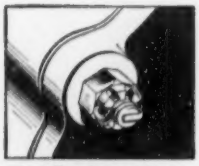
Fletcher Aviation Corporation

PASADENA CALIFORNIA

AMERICA'S FOREMOST PRODUCER OF JETTISONABLE FUEL AND NAPALM TANKS

FASTENER PROBLEM

How Piasecki cut costs
and assembly time on transmission fastenings



Castellated nut and cotter pin combination . . .

. . . replaced by one-piece, ELASTIC STOP nut.

Helicopters demand dependably vibration-proof fasteners for all critical applications. This once meant expensive and cumbersome castellated-nut and cotter pin combinations. Now Piasecki Helicopter Corporation uses ELASTIC STOP nuts on transmission housings and attachments in aircraft like the HUP-1 shown above.

By using standard AN-365 ELASTIC STOP nuts, Piasecki cut parts costs and speeded assembly. These self-locking nuts stay tight, right where you put them, in spite of vibration and stress reversals. They form a tight seal against the threads to prevent corrosion and seepage, yet can be removed and re-used many times.

Mail the coupon below for further information on ESNA self-locking fasteners.

ELASTIC STOP NUT CORPORATION OF AMERICA

Dept. N41-525, Elastic Stop Nut Corporation of America
2330 Vauxhall Road, Union, New Jersey

Please send the following free fastening information:

☐ Elastic Stop nut bulletin
☐ Rollpin Bulletin
☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name _____ Title _____

Firm _____

Street _____

City _____ Zone _____ State _____

Army, Navy and Marine aircraft in the South Pacific. In November 1943, he was transferred to command of the 15th Air Force in Italy, where Twining directed a major portion of the AAF heavy bomber offensive against German-occupied Europe.

▶ **Alaskan Commander**—After the end of the European War, Gen. Twining returned to the Pacific theater, where he commanded the B-29 equipped 20th Air Force for the final offensives against Japan. In the early post-war years, he headed the Continental Air Command and Air Materiel Command and, in 1947, was named commanding general of the Alaskan Theater in charge of all Air Force, Army and Navy units in that area.

He returned to the Pentagon in 1950 for a brief term as Deputy Chief of Staff for Personnel and was appointed Vice Chief of Staff after the death of Gen. Muir Fairchild late that year.

Gen. White, who gets a fourth star with his new post, had a pre-war Air Force career that took him to diplomatic posts in China, Russia, Italy, Greece and Brazil—developing his facility with eight languages. His combat record began in 1944 as deputy commander of the 13th Air Force in the Southwest Pacific after earlier service as chief of staff of the 3rd Air Force (a training group) in Florida and director of intelligence at AAF headquarters in Washington.

▶ **Pacific Commands**—White served with the 13th Air Force through the New Guinea and Southern Philippines campaigns. He participated in the assaults on Palawan and Zamboanga in the Philippines and temporarily commanded the 13th during the invasion of Borneo.

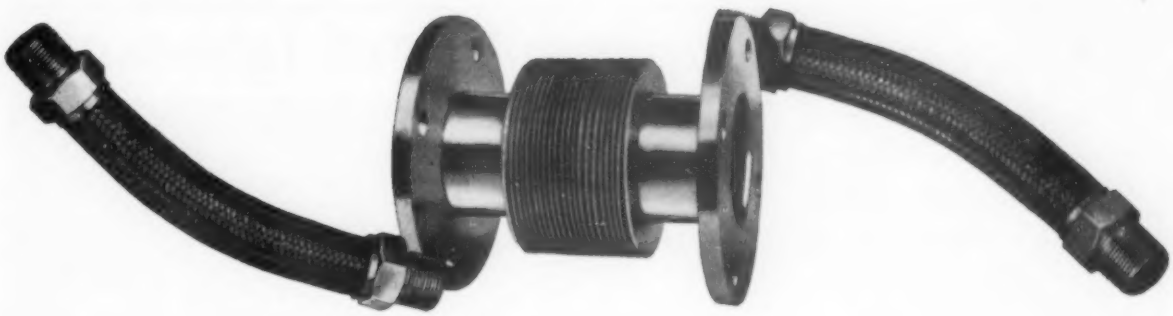
In June 1945, he took command of the 7th Air Force in the Marianas when it became a component of Gen. Kenney's Far East Air Forces. White also served in the Pacific after the war as chief of the Far East Air Forces and commander of the 5th Air Force in Japan.

His postwar Pentagon experience began late in 1948 and continued during the critical congressional investigation of the B-36 as director of legislation and liaison in the office of the then Secretary of the Air Force, W. Stuart Symington.

In May 1950, Gen. White was appointed USAF member of the Joint Strategic Survey Committee in the Joint Chiefs of Staff. Six months later he was named USAF director of plans. He has been Deputy USAF Chief of Staff for Operations from July 1951.

Further changes in the USAF top staff and major field commands are expected during the summer as the new Republican Administration consolidates its position.

Are these 3 new to you?



It would pay you to know all about them

Don't let their modest appearance fool you; these are puzzle-busters and job-simplifiers extraordinary.

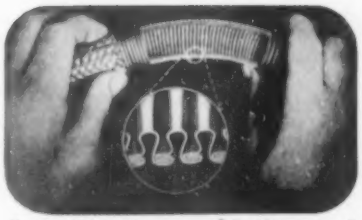
This is **TITEFLEX®**—*the* All-Metal Flexible Hose with 1001 industrial applications. It withstands temperatures, pressures, vacuum, vibration and the corrosive action of a host of liquids and gases. How can you use it? To connect moving parts of machinery. To connect misaligned parts. To absorb vibration, contraction, expansion and pulsation. To "transmit" vacuums or convey high-frequency currents. To shield wire and cables. And to handle difficult materials—from acid and ammonia to sea water or steam.

Here's **UNIFLEX**—the new *Helically-corrugated* Seamless Flexible Tube. It's tough, corrosion-resistant, leak-proof. And its *helical* construction gives it greater flexibility and longer life in applications too critical for ordinary concentric tubing. UNIFLEX is for you—if you're concerned with hydraulic lines, oil burners, refrigeration machinery, air conditioning equipment, pumps, compressors, diesels or machine tools. For leakless service, UNIFLEX fittings have metal-to-metal seat. Seal is produced through spring washer effect of hose on fitting body.

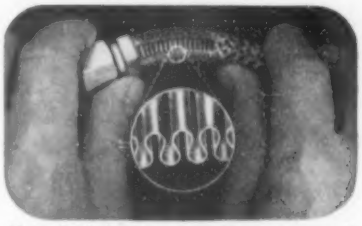
TITEFLEX BELLOWS are the *efficient* means of absorbing lineal movement in many types of equipment. Their welded, convoluted-diaphragm construction lets them do this without weakening the lines in which they are inserted and without reducing the flow rates of gases or liquids being conveyed. You can use TITEFLEX BELLOWS to seal high pressure valves and shafts, accommodate lineal contraction and expansion or high frequency vibration, and to handle gases and corrosive liquids under high temperature conditions. Special designs are available and complete bellows assemblies can be furnished with any required types of fittings.

Get the facts without obligation

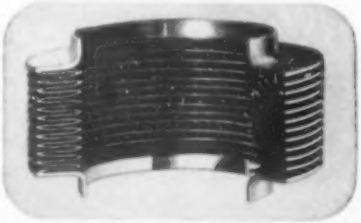
TITEFLEX literature contains full descriptions, technical data and suggestions for use. And Titeflex Designers and Engineers have a thorough knowledge of these products' behavior under exacting service conditions. Check the products that interest you and mail the coupon today. We'll be glad to help you with any specific problem.



Sectional view shows rugged, flexible, seamed construction of Titeflex.



Note the helically-corrugated, seamless wall structure of Uniflex.



Cross-section shows the welded, convoluted-diaphragm construction of Titeflex Bellows.

Let Our Family of Products Help Yours

Titeflex

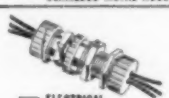
✓ Check products you are interested in.

☐ SEAMED AND SEAMLESS METAL HOSE

☐ PRECISION BELLOWS

☐ IGNITION HARNESS

☐ IGNITION SHIELDING



☐ ELECTRICAL CONNECTORS

☐ RIGID AND FLEXIBLE WAVE GUIDES

☐ FILTERS

☐ FUSES

TITEFLEX, INC.
517 Frelinghuysen Ave.
Newark 5, N.J.

Please send me without cost information about the products checked at the left.

MAIL COUPON TODAY

NAME _____

TITLE _____

FIRM _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

NACA Charts Our Spheres of Ignorance

- **Designing for high speed introduces uncertainties.**
- **Problems include flutter, control, stability.**

By David A. Anderton

Langley Field, Va.—It's going to be a long time before we really know how to design highspeed airplanes.

That is the impression you get after listening to many of the top scientists of the National Advisory Committee for Aeronautics. The 1953 biennial inspection of the Langley Memorial Aeronautical Laboratory here at Langley Field hammered home the vast number of uncertainties still confronting the confused designer. These uncertainties rise out of the many problems of trying to get an airplane to fly well at subsonic, transonic and supersonic speed.

▶ **Across the Board**—Somewhere near the top of the list are the problems of flutter; right near them, the worries of stability and control at high speed. Further down the line are the details of riveted construction, landing gear design and surface roughness. Then there are a whole string of basic research problems seeking to explain the effects of boundary layers, shock waves and other fundamentals. There are problems right across the aeronautical research board.

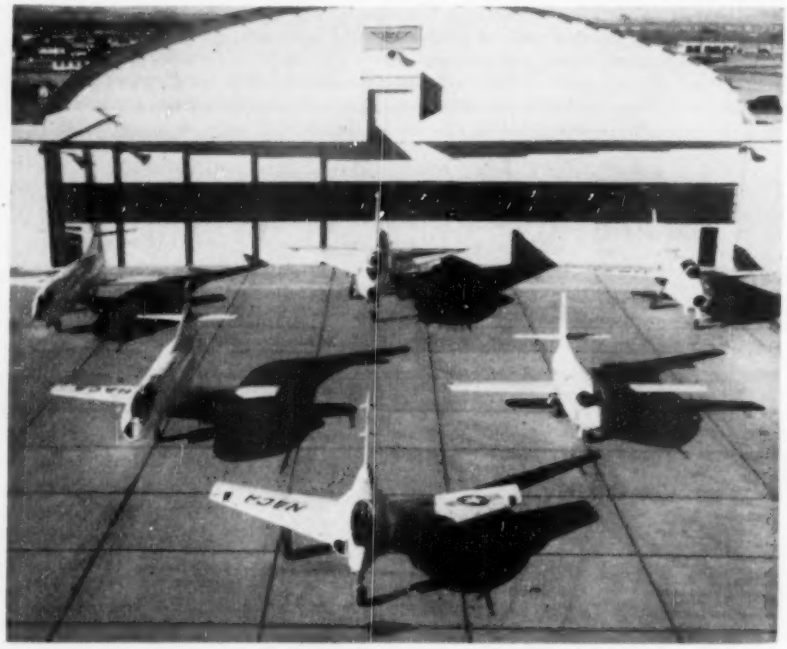
This article describes some of the current difficulties, and what NACA is doing, or hopes to do, about them.

• **Aircraft crash fires.** Fire following a crash may become a rarity in the future, if the full-scale tests conducted by NACA's Lewis Laboratory at Cleveland are any indication. After actually crashing a number of war-weary Curtis C-46 and Fairchild C-82 planes into barriers designed to smash and rip vital installations, NACA scientists were able to get an insight into the mechanisms that caused fires to start (AVIATION WEEK Jan. 26, p74). This had always been the missing link in aircraft fire research.

Out of the tests came a fundamental approach to stopping fires by preventing them from getting started. Since the powerplant nacelle and the associated hydraulic and electrical services for the airplane seemed to be the source of hot spots that caused ignition, NACA devised an inerting system for canceling out the effect of these ignition sources.

The system cuts off electrical services

8-FT. WINDTUNNEL at Langley is now undergoing calibration runs. It will go to Mach 1.4, help in transonic investigations.



CURRENT TEAM for NACA transonic and supersonic research includes (l. to r.) D-558-II, D-558-I, X-4, XF-92A (rear), X-1 and X-5.

and the fuel, discharges a slug of carbon dioxide into the air intake to purge the engine and squirts water on the hot exhaust collector.

No plane equipped with the inerting system caught fire after crash, although tanks were ripped open and fuel spilled and vaporized deliberately.

• **Flutter.** There is a new variation on the old theme of airplane flutter and it is a particularly sinister one called "chordwise flutter."

In an awesome collection of high-speed movies, NACA showed a stub wing of low aspect ratio failing with little warning almost immediately after developing chordwise flutter.

This is just one of the several kinds of flutter that have been identified. It shows up as distortions in a chordwise direction; the metal takes on frightening flexibility and undulates wildly between leading and trailing edge. In the specimen which was shown, failure was abrupt and complete by combination of shear and bending at the wing root.

Flutter studies are receiving high priority at Langley because of their importance in highspeed flight. But as the annual report of NACA says, " . . . flutter has become so complex that scientists have been frustrated in attempts even to formulate it theoretically, much less suggest theoretical solutions. . . . The most effective solutions are resulting from experimentation."

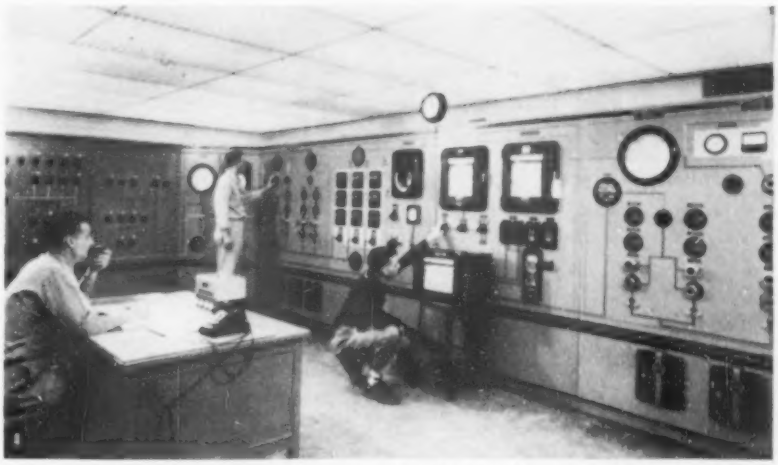
• **Structural details.** If you are designing web-to-flange connections using a bend radius of four to six times the metal thickness, you are penalizing the structure. What you want is a right-angle bend with no bend radius.

This startling approach is the result of a series of tests made at Langley on identical multi-web box beams—identical, that is, with the exception of the bend radiuses on the flange-web connections. The beam that failed at around 30,000 psi. with a six-times bend radius held up to just short of 50,000 psi. with a zero bend radius.

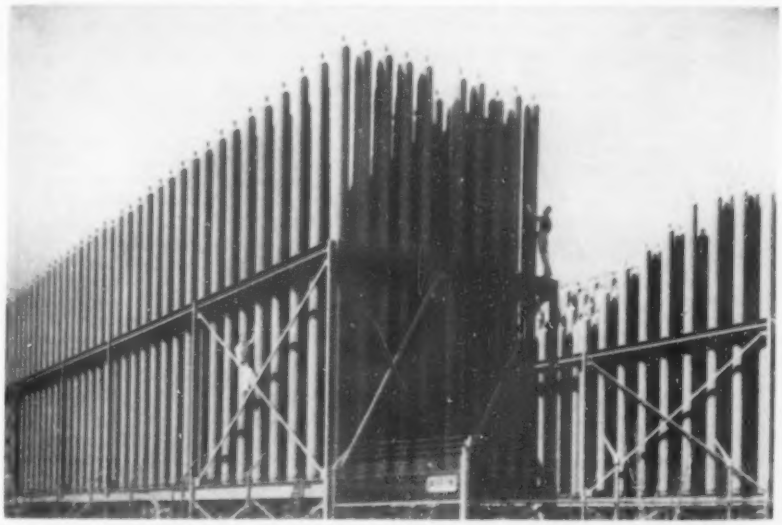
• **Stability.** Pitchup at high speed is a scary thing to watch, and undoubtedly much worse to experience. It happens at high angles of attack for certain configurations of airplane—NACA used a sweptwing, high-tailed model as an illustration—and involves a reversal in slope of the pitching moment curves. To the pilot, it shows up as an increase in angle of attack out of all proportion to what he usually gets from a known stick deflection.

During the resultant erratic unstable motion of the airplane after the start of pitchup, the angle of attack fluctuates wildly between extreme negative and positive values, while the roll angle changes rapidly. The motion is extremely complicated and hard to describe—it has to be seen to be believed.

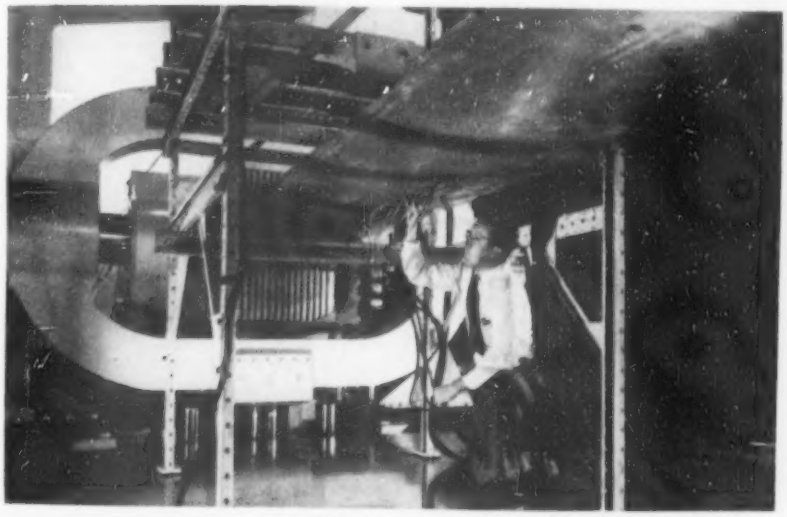
There are ways around this, however,



GAS DYNAMICS LAB can simulate speeds up to Mach 9.0 or altitudes to 200,000 ft. This is the control room.



STEEL BOTTLES store clean, dry air at up to 5,000 psi. for Gas Dynamics Lab. Air at this pressure is one-third as dense as water.



WING LOADS are studied in testing machine that can apply tension or compression combined with twisting and shearing loads.

(Advertisement)

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

Here goes—right into the middle of the "hot rod" fighter controversy. There are arguments on both sides of the weight issue, and the eventual decision will be fine-line and far-reaching.

While there is a growing need for weight reduction, the answer lies neither in ripping the so-called "gadgets" out of present fighters nor in building stripped-down combat planes.

Hot rod proponents point to the arguments of jet aces back from Korea, the pilots who criticize the North American Sabre's high altitude performance against the MIG 15 although they're on the long end of a 10-to-1 kill ratio. The MIG is better than the F-86, they say, because it's two tons lighter with no unnecessary equipment. It's like belittling Citation because he isn't a quarter horse.

Still, these boys know what they're talking about . . . they've fought the MIG. But what of the long-range view? What if we build lightweight, short-range fighters, then find that future action demands the range, electronics, and safety factors we have eliminated. What price hot rods then?

Collectively the jet aces say there are too many gadgets such as self-sealing fuel tanks, parking brakes, duplicate fuel system, excess radio equipment, forward armor plate, electronic gun sights, too much ammunition. But individually they disagree as to just what to take out and what to leave in.

They almost all reached agreement that self-sealing tanks, forward armor and excess ammo were useless in high altitude combat against the MIG's explosive cannon shells, tail attacks and split-second passes. Then, as happened recently, the pilots were called upon for ground support missions. Did they welcome these safety factors and the fire power advantage? You bet they did.

Of course, you can't lighten a fighter to any worthwhile degree by merely throwing out gadgets. A majority of the weight, perhaps 10-to-1, is in structure and fuel and power plant. The answer must be found in new designs, with weight elimination considered every step of the way.

Immediately you're confronted with the complexities of modern combat and the human equation. At today's speeds and altitudes certain items are mandatory – pressurization, cooling, ejection seats, etc.

I agree there are safeties on safeties to an absurd degree in some cases. But by and large what of the lads who will be learning to fly the hot rods? What of their morale and that of their families? Coldly, what of training and production costs? A pilot killed and a plane washed out for gear or fuel failure is the equivalent of a combat loss.

And what about performance? Let's say you save 3000 pounds in fuel and structure by cutting a 500-mile combat radius to 300 miles. If you do, your fighter won't be able to fight near the Yalu and return. Or—why not take a chance and weaken the load factor by one G? It'll save you 1000 pounds—at the expense of structural strength.

I have an idea that a big majority of jet pilots who have criticized the F-86 would choose it if it came to a showdown between the Sabre and the MIG deep over enemy territory.

So it's not just a question of what fighter pilots want today. It's what they will need in the future and what they have to meet that need. The 10-to-1 kill ratio, achieved with training and leadership as well as planes, is terrific. Perhaps it is better to hold that ratio rather than have 13-to-1 today and 5-to-1 tomorrow.

Then, too, it must be remembered that Russian planes are not lighter than the Sabre from calculated design. Red aircraft, you'll find, are increasing in weight as rapidly as they can incorporate the advances we deem necessary.

The problem is not to put money into stripped-down aircraft that will have super-speed, fast climb, limited range and no versatility; neither is the problem to build weight, strength, safety, range and versatility into them, at the expense of performance.

Rather, I'm convinced the answer lies in a critical analysis of requirements, in better planned designs, in engines with better weight-power ratios, in rocket armament that will halve the weight of guns, in metallurgical developments, miniaturization and technological achievements that will hold and even reduce weight as performance goes up.

and NACA is investigating them. One important factor in all stability problems is the distribution of mass in the fuselage, which ties in with the airplane design configuration. Numbers of configurations are under study by the NACA with the aid of free-flight models launched from a catapult into nets.

Film studies of these test flights will show much that will help in avoiding such catastrophic instability early in the design stage of the airplane.

• **Landing gear.** Judging by the amount of emphasis on landing gear research at Langley, there is considerable worry about the increasing size and weight of this component.

Three sets of forces act on gears: the vertical, which NACA feels is well understood; the side force, being studied analytically and experimentally—it may be as much as 70% of the vertical load; and the drag force, currently being studied by experiments which "land" a typical gear on a special runway down the middle of what is normally the towing basin.

Sliding friction, which is present during tire spin-up, is less known than almost anything else, says NACA, but its engineers are hard at work on tests that should give some clues to the right answers.

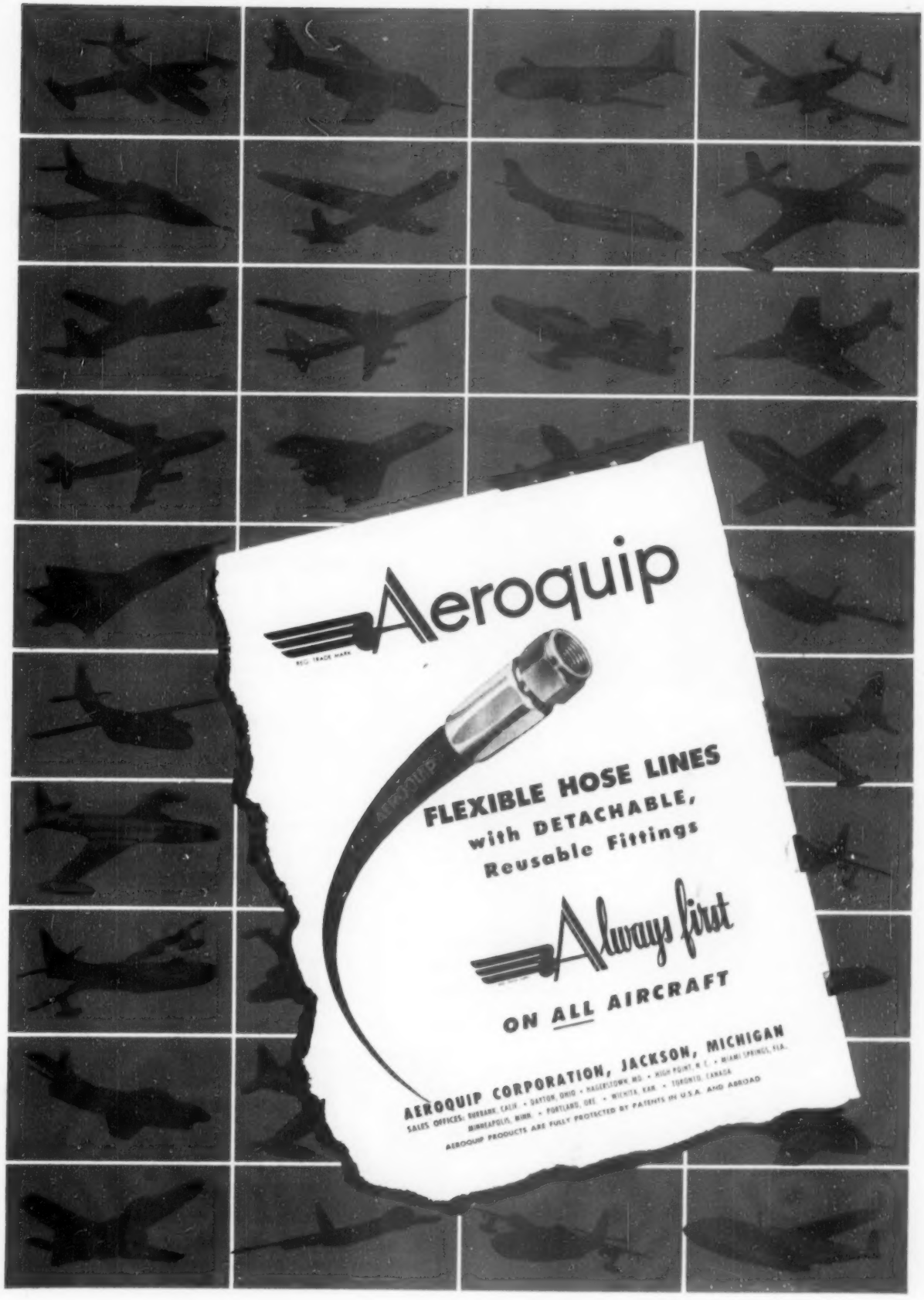
Hand in hand with this work is a study being conducted by NACA's Flight Research group on actual landings of contemporary transports. So far the group has filmed the landing gear with special camera equipment during 487 routine landings at Washington airport. These film records have been analyzed statistically to find—among other things—the frequency distribution of sinking speeds. So far, 70 out of 243 landings analyzed have shown a sinking speed of one to one-and-one-half feet per second. This speed is the most frequent among the landings studied.

This work is aiming toward better understanding of the landing gear loads so that eventually lighter and better gear can be designed from a complete new set of criteria.

• **Aerodynamic heating.** A spectacular demonstration showed the difficulties facing the designer of highspeed airplanes. A delta-wing model was vibrated and began to flutter at 1,450 cycles per minute. This resonant condition was easily stopped by dropping the exciting frequency to 1,200.

But with the wing vibrated at 1,200, heaters were swung down over the leading edge. They simulated the effect of aerodynamic heating at Mach 3.0 or so. Immediately after they were turned on, the wing began to respond until it was fluttering strongly at 1,200 cycles, the same frequency which had been "safe" before.

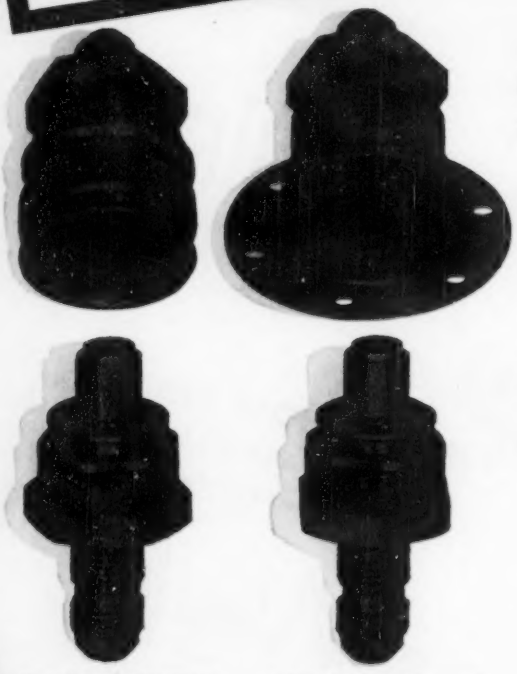
This is just another indication of the


Aeroquip
REG. TRADE MARK
AEROQUIP
FLEXIBLE HOSE LINES
with DETACHABLE,
Reusable Fittings
Always first
ON ALL AIRCRAFT
AEROQUIP CORPORATION, JACKSON, MICHIGAN
SALES OFFICES: BURBANK, CALIF. • DAYTON, OHIO • HAGERSTOWN, MD. • HIGH POINT, N. C. • MIAMI SPRINGS, FLA.
MINNEAPOLIS, MINN. • PORTLAND, ORE. • WICHITA, KAN. • TORONTO, CANADA
AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

ANNOUNCING

WIGGINS INST-O-MATIC COUPLINGS

3000 PSI



Manual Quick Disconnect (Push-Pull Positive Action)

Automatic Quick Disconnect (Breaks Away at Pre-determined Weight Load)

HERE ARE THE HYDRAULIC "SELF-SEALING" QUICK-DISCONNECT COUPLINGS YOU HAVE BEEN WAITING FOR

FEATURES

Disconnects under system pressure
Light weight · Compact · Positive
Safe

SIZE RANGE

$3/16" - 1/4" - 5/16" - 3/8" - 1/2" - 5/8" - 3/4"$

OTHER HIGH-PRESSURE COUPLINGS ALSO AVAILABLE:
FOR PNEUMATIC SYSTEMS
FOR BALLISTIC SYSTEMS
(such as seat and canopy ejectors)

Also AUTOMATIC BREAK-AWAY COUPLINGS
(for drop-tank systems)
AND REMOTE ACTUATED COUPLINGS
(for missile use)

Write for further information

Wiggins

E. B. WIGGINS OIL TOOL COMPANY, INC.
3424 East Olympic Boulevard, Los Angeles 23, California

REPRESENTATIVES: AIRSUPPLY COMPANY: Offices in Los Angeles, Seattle, Wichita, Ft. Worth, Tulsa, Kansas City, and San Diego. **AERO ENGINEERING, INC.:** Akron, Indianapolis, Mineola, N.Y. Baltimore. **HARVEY PIPE:** Dayton. **G. S. GROVES:** Cleveland. **G. R. CARRIER:** Chicago. **CHARLES MORGAN:** Boston. **AERO SALES ENGINEERING, LTD.:** Montreal.

complexity of the design criteria in store for the future. Actually, it is only one of the many effects of aerodynamic heating on aircraft. Others include lowering the strength of the materials used because of elevated temperatures, internal stresses and uneven loads because of non-uniform temperature distribution over the wing, and local distortion and alteration of attachment loads because of the same uneven distribution.

• **Interference.** This kind of drag has always been a problem. Just when designers were getting used to the ways of getting low drag with subsonic airplanes, we sped through sonic velocities and started the race all over again.

Tiny drag increments are much more important now than they were before. With power-available and power-required curves running almost parallel in the supersonic range, a small difference in drag can mean a tremendous difference in speed—perhaps measured in hundreds of miles per hour.

In one example, NACA quoted a subsonic speed that became supersonic after an investigation showed the way to removing much of the interference drag. Tied into this problem is the effect of external stores on buffeting and flutter as well as drag.

Through the use of dynamically similar models and rocket-powered free-flight models with external packages, NACA is delving deep into the mechanisms that set wings and tails shaking. Already troubles have been cured as a result of these continuing studies.

▶ **New Facilities**—There are two new basic research tools this year at Langley.

• The first—and most spectacular— is the eight-foot transonic windtunnel, which has speed capabilities up to about Mach 1.4 Speed, pressure and temperature of the air can be varied during tunnel operation. The tunnel is now undergoing calibration runs, and doing some basic research in addition. It will be about a year before the new facility can shoulder its routine work load.

• The second new unit is the Gas Dynamics Laboratory. This is a fundamental establishment which is to be used for better understanding of the physics of highspeed flight. It can simulate flight speeds up to Mach 9.0, or altitudes up to about 200,000 ft.

There are nine test cells, with air jets from nine inches to 20 in. square. Out of the nine cells, four are hot jets at 15 to 1,500 psi.; four are cold jets at the same pressure range, and one is a hot jet at a range from 1,000 to 3,000 psi.

▶ **Values and Opinion**—What does all this add up to? More than ever, the welter of research problems being tackled by the NACA is simply an indication of the philosophy pointed out earlier (AVIATION WEEK, Mar. 2, p. 147)

SECURITY SYSTEM for Jets
THE STORY OF ALL-WEATHER PROTECTION
FULL POWER
A clear inlet for maximum performance.
FULL PROTECTION
Rugged defense against debris.
FULL CLOSING
For maximum range with engines inoperative. For ground protection.
Retractable Air Inlet Screens by
SMITH-MORRIS COMPANY
AIRCRAFT EXHAUST MANIFOLD SYSTEMS
GAS TURBINE PARTS AND ASSEMBLIES
FERNDALE 20, MICHIGAN

OA106

VICKERS VISCOUNT

FOUR ROLLS-ROYCE DART PROPELLER-TURBINE ENGINES

Trans-Canada Air Lines are to introduce the Viscount on their inter-city services towards the end of 1954. It will then become the first turbine-engined airliner to operate in North America.

VICKERS-ARMSTRONGS LIMITED · AIRCRAFT DIVISION · WEYBRIDGE · SURREY · ENGLAND

that this is the year of the second-order effect. The NACA, like other research and scientific bodies, is finding out how much remains still to be learned.

Much good has come out of this approach. To this observer, the thinking which evolved the inerting system to prevent crash fires is worth every research dollar NACA has received since its inception in 1915.

Research does solve current problems, and that is where the tangible payoff is most obvious. But as NACA's annual report says, research ". . . is most productive when it reveals new knowledge, leading to new applications.

"In the race for air supremacy, the date for the ultimate test is unknowable. The time available to carry out a logically planned research program is, consequently, a matter of judgement. What is left undone now may never be undertaken."

THRUST & DRAG

Induced Drag Coefficient Award this week goes for the hue and cry created in some newspapers as the result of the visit of two Russian military attaches to SAE's National Aeronautic Meeting (not to be confused with the aircraft production forum, which was only one day out of the week-long meeting).

As practically everybody knows, such meetings, with the exception of occasional classified sessions, are open to the public. Copies of the papers (and there were none for the production forum) can be bought by anyone. Each presentation is cleared in advance by security officers. Also—and maybe my mouth ought to be washed out with soap for saying so—some engineers felt that no world-shaking ideas were revealed during the meeting.

So let's not worry about those SAE papers down in the Russian Embassy.

* * *

Some of us were discussing missiles the other day, particularly the Vought Regulus, which currently is using drone guidance and later will use self-contained homing devices. We were trying to devise a definition that would be more specific than "guided missile," and help to separate a "true" guided missile from a drone.

We're still trying. Among other ideas, we said that you had to tell a drone where to go to hit the target, but a missile only had to be told where the target is. That seemed to knock out intelligence on the missile's part, so we developed this current definition: You tell a drone where to go, and you tell a missile when to go. What's your definition? —DAA

A.V. ROE CANADA LTD. specifies "16-25-6" for rotor wheels in new Orenda jet engine

FROM the first designs to volume production, "16-25-6" was the alloy selected for rotor wheels in the new Orenda jet engine. A. V. Roe Canada Limited says, "No other alloys were considered during the development, since this particular alloy had become identified by and large as *the* successful specification . . . ".

Acceptance like this has made "16-25-6" the most popular super-alloy steel for jet engine rotor wheels. It was first developed by the Timken Company during World War II and since it was the *one* suitable steel that could be produced commercially for jet engine rotor wheels, it helped make jet propulsion practical.

Today, more "16-25-6" goes into solid and composite jet engine rotor wheels than all other super-alloy steels combined! That's because "16-25-6" has the *best* combination of the three top requirements for jet engine rotor wheels: 1) It has good high temperature properties. Operating at temperatures up to 1500°F., it retains high creep and stress rupture strength. And it has excellent resistance to scale and corrosion. 2) It is relatively low in strategic alloys. "16-25-6" uses none of the highly strategic alloys, contains no cobalt or columbium. 3) It has good machinability.

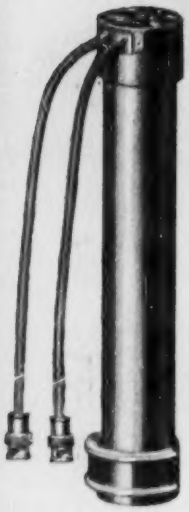
Make use of the Timken Company's wide experience in high temperature steels. We'll help you adapt "16-25-6" to your purposes—or help you pick other alloy steels suited to your needs. Write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

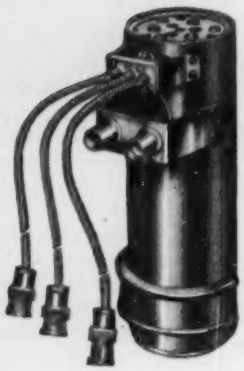
YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

LIQUIDOMETER Gravimetric and Volumetric Liquid Measuring Systems

Capacitor Type





Liquidometer capacitor type fuel quantity measuring systems feature the simplest and most fundamentally straight-forward circuits.

These systems can provide individual indication or totalizing of fuel volume or weight, low level warning, fuel transfer switching, airplane center of gravity control and other auxiliary functions.

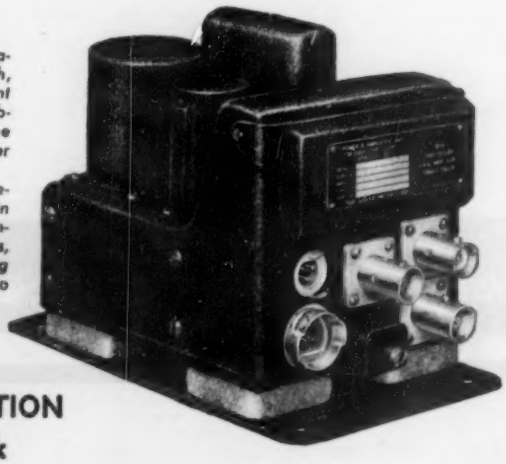
One type measures the weight of fuel based on an assumed relationship between its density and its dielectric constant. Another type is independent of fuel dielectric constant and is the only system which really gives "true" fuel weight indication. This type automatically combines the volume as measured by tank units and a dielectric reference condenser, with density as measured by a Liquidensitometer. An uncompensated type is also available.

If desired, Liquidometer fuel weight measuring systems can be arranged to provide volumetric "full' tank indication, regardless of the type fuel or its temperature. This feature is of material benefit during ground or airborne refueling operations.

Indicators, power units and tank units are rugged, compact and are of lightweight construction. They combine the features of sound progressive engineering, expert workmanship and best quality materials.

For more than three decades The Liquidometer Corporation has concentrated almost exclusively on the research, design and manufacture of liquid quantity measurement systems and the attendant installation and service problems. This specialization has proved to be of great value to the aircraft industry which has used Liquidometer products extensively since 1929.

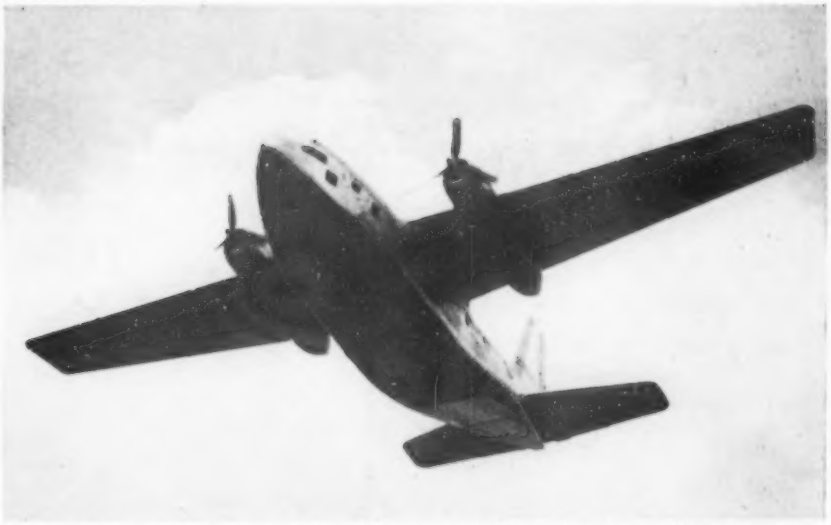
In the capacitance method of fuel quantity measurement Liquidometer started extensive research back in 1940. It was the first to recognize such needs as compensation for fuel dielectric and density differences, correction for variations in fuel levels caused by varying attitudes of aircraft, and tank unit characterization to provide uniformly spaced indicator graduations.



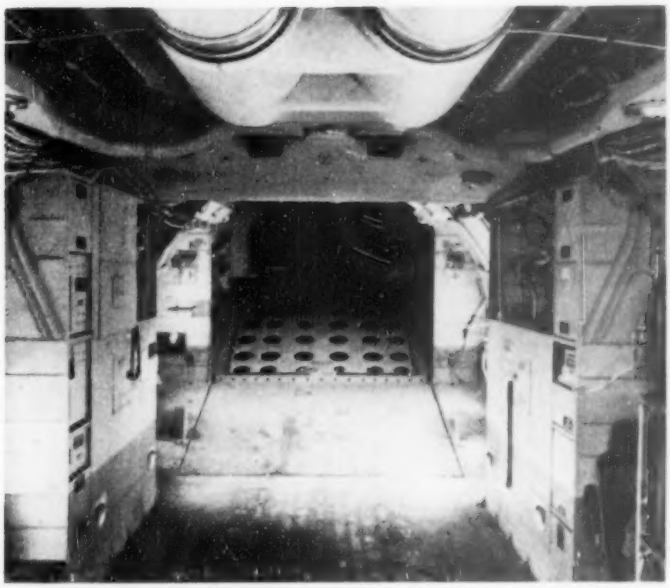
THE LIQUIDOMETER CORPORATION

Long Island City 1, New York

Assault Transport Details



CHASE C-123B is Air Force's answer to problem of getting combat troops into action fast. Plane's design cruising speed is 205 mph.



LOOKING BACK Drop-down loading ramp of Chase C-12B is in middle foreground; rear section hinges up.

FORWARD VIEW shows line of troop seats in center.

TWO TAILS Closeups show how tail of production C-123B (left) differs from that of prototype XC-123 (right). Top of fin has been squared off and angle of leading edge made steeper. As an assault transport, C-123B is designed to carry 61 fully equipped infantrymen; as an ambulance plane it can carry 50 litters, six ambulatory patients and six attendants. Seats and litters can be removed to convert ship to cargo use. Kaiser-Frazer, which will assemble the new transport at Willow Run, expects to roll out the first one in June. Story of C-123B's debut ran in Aviation Week Apr. 27, p. 15.

Why Do Modern Aircraft Cost So Much?

- **One reason is greatly improved performance.**
- **But buyers' changes help push prices up too.**

The fact that today's military aircraft cost so much has been generally accepted as a logical consequence of the expensive design, production and equipment requirements needed to give high performance.

These same factors will affect the cost picture in the commercial field. As U. S. manufacturers move to hasten the day when our own jet transports will be flying, an increasing amount of study is going into the factors that make the projected price tags of these new aircraft so high in comparison with their piston-powered counterparts.

▶ **Why So High?**—These aircraft costs and the many factors behind them were keenly analyzed by Boeing Airplane Co.'s chief cost accountant, James W. Barton, before a large audience of industry engineers at the recent National Aeronautic Meeting of the Society of Automotive Engineers, in New York.

For his analysis, Barton assumes three transport planes similar in physical respect to the Boeing 247-D, 307 and 377 (Stratocruiser). He considers the basic cost data for such a plane series; he adjusts for a uniform quantity, a uniform profit rate; eliminates cost advantages gained by concurrent production of similar military articles or by customer-furnished equipment.

Barton, in his analysis, calls these planes by the years in which their principal costs were incurred—Model 1933 (247-D), Model 1939 (307) and Model 1949 (377).

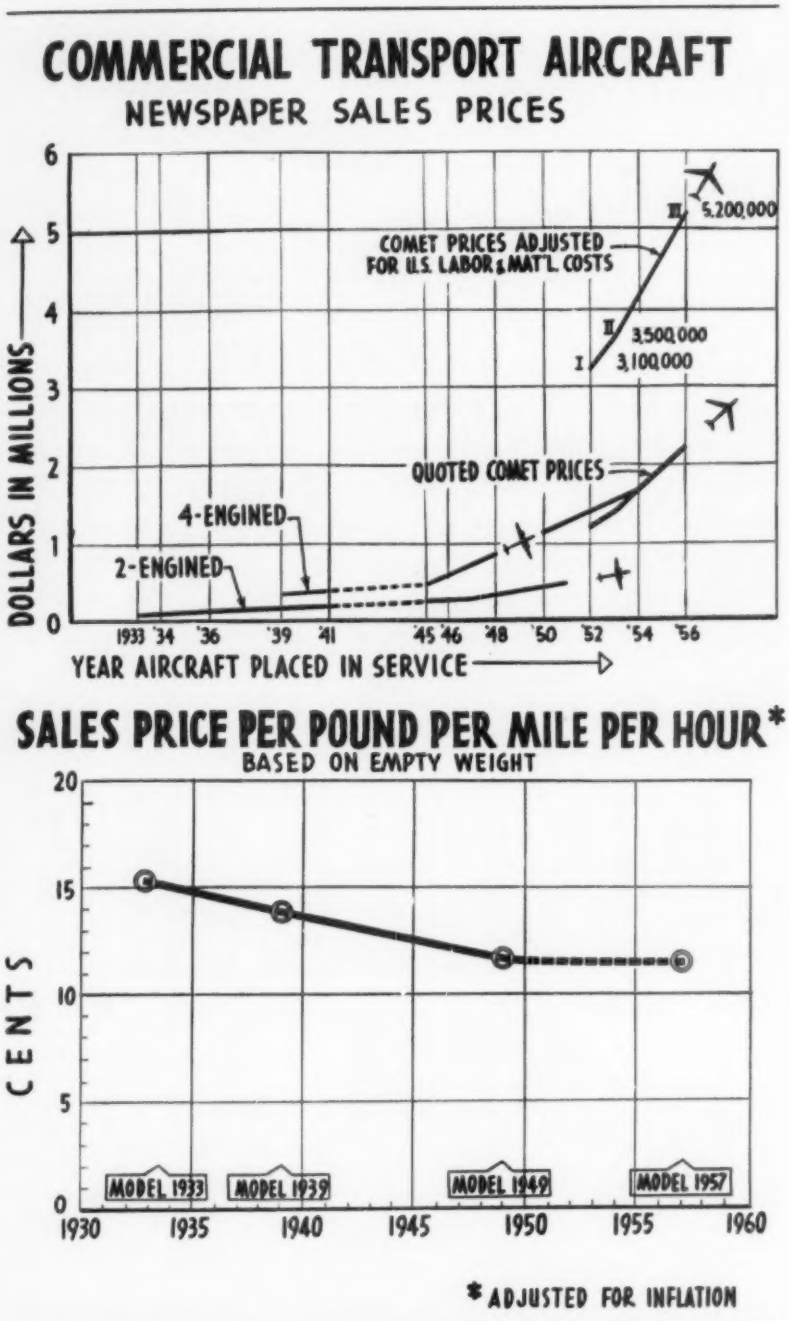
He shows that a 3,420% increase in gross price from 1933 to 1949 was reduced to only 259% based on cost per pound of weight. This 259% is reduced to about a 65% increase by correcting for inflation which occurred in the meantime.

When also corrected for performance improvement, the cost trend is downward. Thus, the price per pound per mile per hour of block speed is less today than it was 20 years ago.

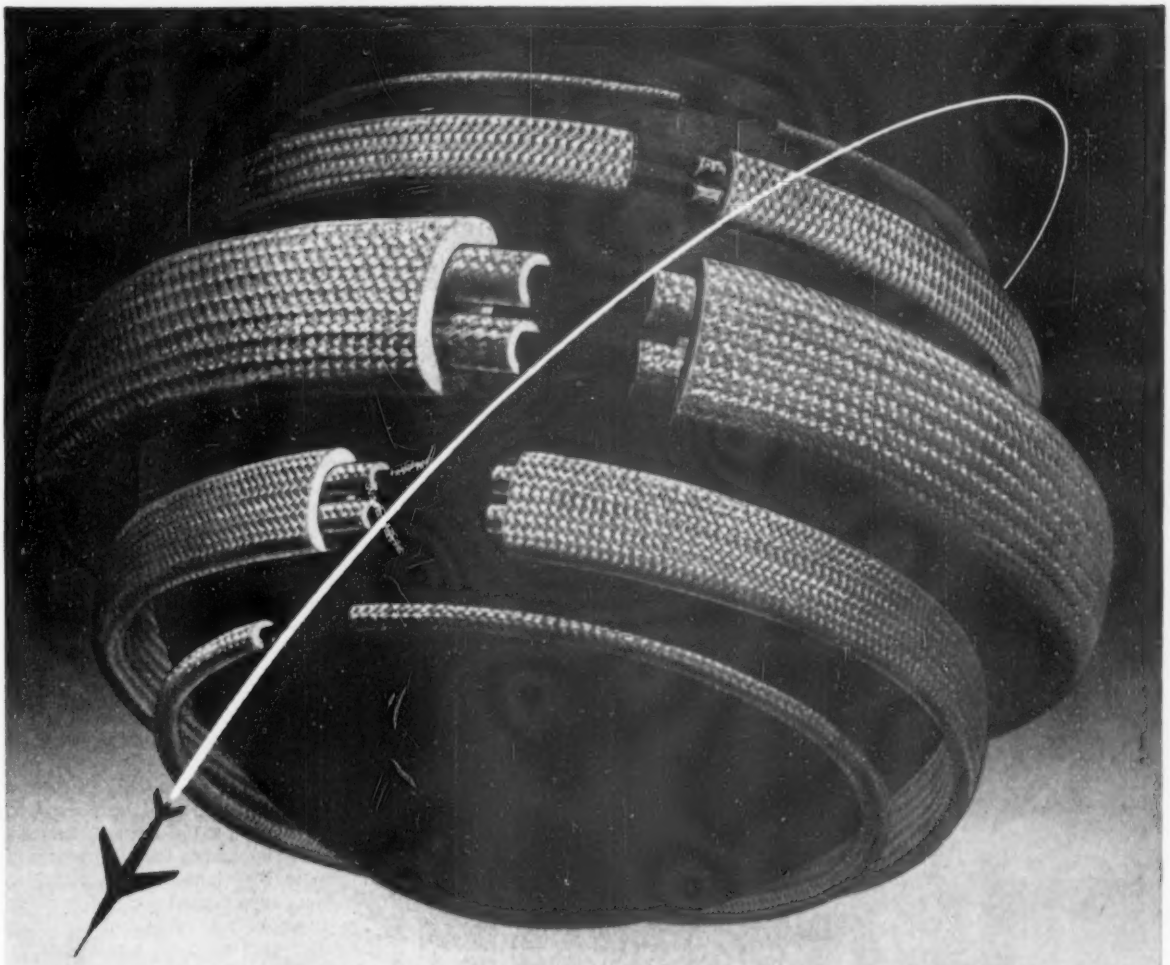
▶ **Two-Decade Advance**—Basic improvements in aircraft have been made in the last 20 years. These include:

• **Cruising speed:** The propeller-driven plane flies more than twice as fast as the 160 mph. of 1933. Jet power will boost this figure sharply.

• **Range:** This has more than tripled from just under 1,000 mi. in 1933. Yet with this increase in speed and range, airplane accidents and passenger



ALTHOUGH SALES PRICES have gone up, cost per lb./mi./hr. has gone down.



For a World of Aircraft High Temperature Insulation Problems...

REFRASIL is Ready—REFRASIL is Right!

The 3 R's of High Temperature Insulation:

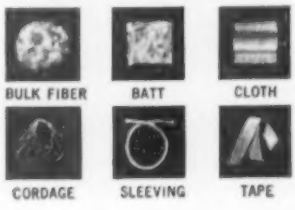
REFRASIL has ALL 3!

Refrasil is *Ready* for critical electrical applications in the Aircraft World with specially processed textile sleeving. Refrasil *flexible* sleeving provides effective space separation for temperatures up to 2000°F. High silica Refrasil is chemically stable, fire-resistant and is unaffected by ordinary acids.

Refrasil is *Right* for the Aircraft World with Lightweight Removable Insulating Blankets using Refrasil Batt enclosed in high temperature foil. Refrasil blankets are specified by 90% of the manufacturers of jet powered planes!

HITCO engineering counsel is yours without charge, and we invite your suggestions for new applications of Refrasil. For free sample of any of the physical forms illustrated below, address inquiries to Mr. A. W. Williams, The H. I. Thompson Co., 1733 Cordova Street, Los Angeles 7, California.

REFRASIL is available in a variety of physical forms:



Write or call your nearest REPRESENTATIVE:

EASTERN
Fred W. Muhlenfeld
6659 Loch Hill Road
Baltimore 12, Md.
Valley 3135

MIDWEST
Burnie L. Weddle
3219 West 29th St.
Indianapolis 22, Ind.
Hickory 8685

SOUTHWEST
Marshall Morris
3513 South Drive
Fort Worth, Texas
Webster 2965

REFRASIL

Represented in Canada by RAILWAY & POWER ENG. CORP. LTD.

HITCO

THE H. I. THOMPSON CO.
1733 Cordova Street
Los Angeles 7, California
Phone Republic 1-9161

FOR JET ENGINES
MASS PRODUCED with the aid of...

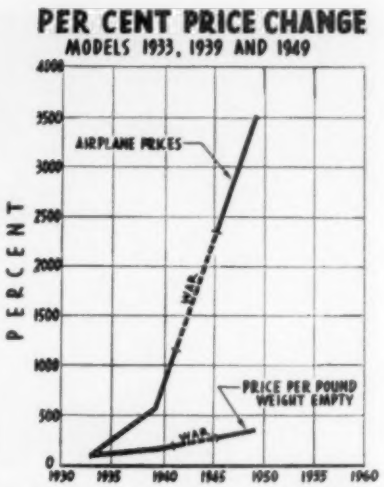
microcast®

Turbine-type jet engine units develop "push" with the aid of hundreds of tiny power blades and buckets. These parts are made of high-temperature alloys by the Microcast Process. This mass production technique solves the problem of handling the hard, virtually non-machineable alloys required for jet power plants at substantial savings. This flexibility and economy in producing high-heat alloy parts can be put to work for you. Let us show you how precision cast parts can fit into your product's design. Write for 16-page booklet and information on the new MICROCAST color movie.

MICROCAST PRECISION CASTINGS PROCESS

MICROCAST DIVISION

AUSTENAL LABORATORIES, INC.
234 East 39th St., New York 16, New York
7001 South Chicago Ave., Chicago 37, Ill.



fatalities have shown a decrease.

• **Reliability:** Has increased; time between engine overhauls has been steadily boosted.

• **Passenger comfort:** Has been considerably raised. Insulation and lessening of vibration have been a factor in improved comfort.

Barton analyzes how much these improvements have cost and what elements of engineering-production have been most affected.

▶ **Cost Breakdown**—Sales price per pound of empty weight resulting from recurring production costs, and subclassified by major cost elements is shown in the chart on page 50. Nonrecurring costs include cost of engineering through first release of all details and the cost of basic tooling—design, fabrication and tryout of the first complete set of tools required for the given program.

Recurring costs include sustaining engineering—minor design changes for "shop facility," investigating and answering customer requests of an engineering nature, any special engineering for spares, etc.; sustaining tooling—re-work, repair and maintenance of tools during course of construction; production costs of manufacturing labor, manufacturing overhead, raw material and purchased equipment; and direct charges—insurance, consultants' fees, cancelation cost of sub-contractors, state and city business taxes, performance bonds, etc.

▶ **Basic Factors**—Basic engineering and basic tooling have increased 151% and 102%, respectively, between Model 1933 and Model 1949. This indicates how requirements for increased speed, range, comfort, safety and reliability have cost heavily in engineering and tooling fields.

Barton points out that the basic tooling increase has occurred largely since the time of Model 1939. Modern transports with their heavier struc-

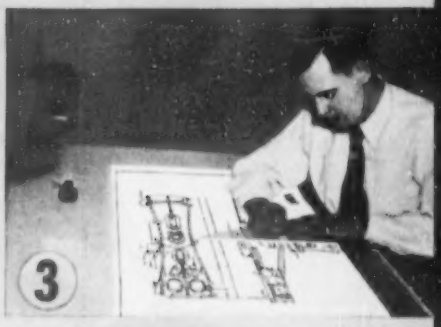
Simple 1-2-3 operation beats the five o'clock deadline

At the Symington-Gould Corporation, Depew, N. Y., extensive revisions are made on drawings of railway specialty equipment... and prints are ready for mailing to customers—hours, even days, ahead of the old schedule.

See how it's done—all so easily—with Kodagraph Repro-Negative Paper . . . another versatile photographic material in the famous Kodagraph line.

A basic drawing—which must be revised to meet the customer's specifications—is exposed on Repro-Negative Paper in a standard print-making machine; then the print is processed in standard photographic solutions. *An easy room light operation* that produces a negative photographic intermediate from the original drawing.

The draftsman obliterates the unwanted detail on the Kodagraph Repro-Negative print by simply applying opaquing ink. The way Symington-Gould figures it, when large areas must be revised . . . or many small scattered changes must be made, this is easier, faster than altering a positive print.



A positive Repro-Negative print is made from the corrected negative . . . on this the draftsman adds the new design . . . and a master is ready to produce the required number of prints. *Ready* in a fraction of the time required previously when the unchanged design was retraced in full.

These Kodagraph Materials also save Symington-Gould time and dollars

- Kodagraph Autopositive Paper is used to reclaim old, soiled drawings; to produce intermediates from customer-drawings on opaque stock.
- Kodagraph Contact Cloth is used to reproduce corrected negative prints when durable, inklike cloth intermediates are desired.
- Kodagraph Autopositive Cloth is used to reproduce new pencil drawings directly, which helps eliminate costly ink tracing.

NOTE: Kodagraph Autopositive Paper and Cloth are processed in the same easy manner as Repro-Negative Paper, but produce positives *directly* from the originals.

Kodagraph Reproduction Materials

"THE BIG NEW PLUS" in engineering drawing reproduction.

Get the full story on the sensational Kodagraph line; learn how you, or your local blueprinter, can process these materials at surprisingly low cost. Write today for a free copy of "Modern Drawing and Document Reproduction."

MAIL COUPON FOR FREE BOOKLET

EASTMAN KODAK COMPANY
***Industrial Photographic Division,* Rochester 4, New York**

107

Gentlemen: Please send me a free copy of your illustrated booklet, "Modern Drawing and Document Reproduction."

Name_____ Position_____

Company_____

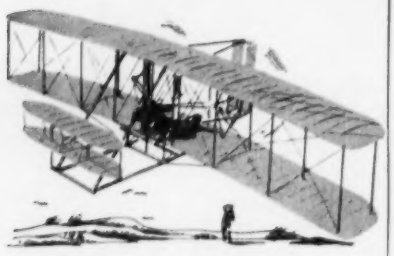
Street_____

City_____ Zone_____ State_____

Kodak
TRADE MARK

50 YEARS AGO

- THE WRIGHT BROTHERS USED A HIP CRADLE FOR CONTROL

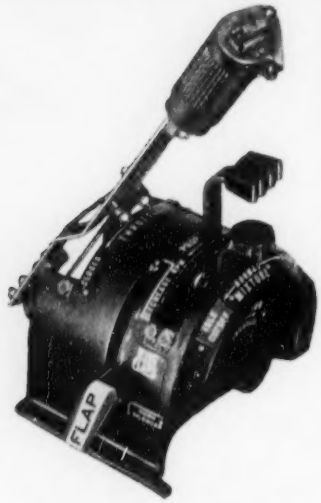


NOW

PILOTS RELY ON

ADAMS-RITE

GRIP CONTROLS AND QUADRANTS



The quadrant illustrated has been developed for one of the latest high performance trainers. ADAMS-RITE can build complete engine control quadrants to your specification or can supply component parts from throttle control grips to control knobs to NAS configuration.

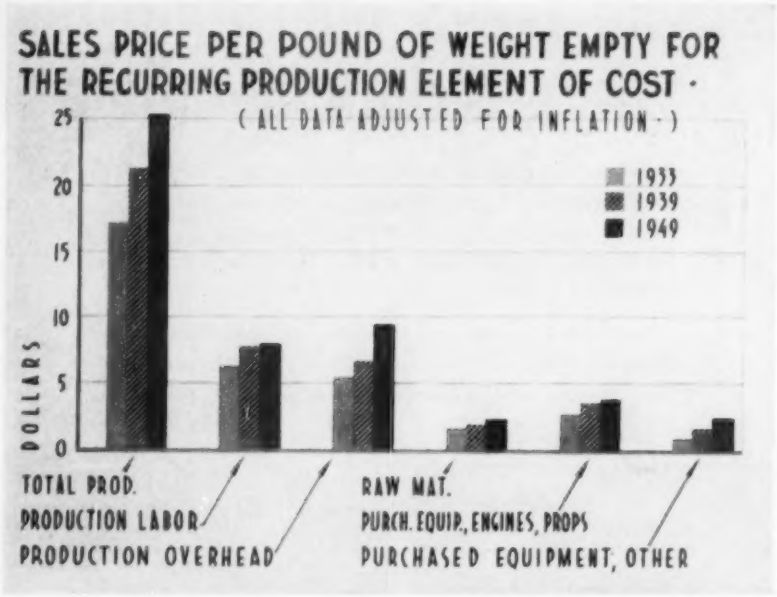
To insure quality, economy and speed you can rely on ADAMS-RITE.

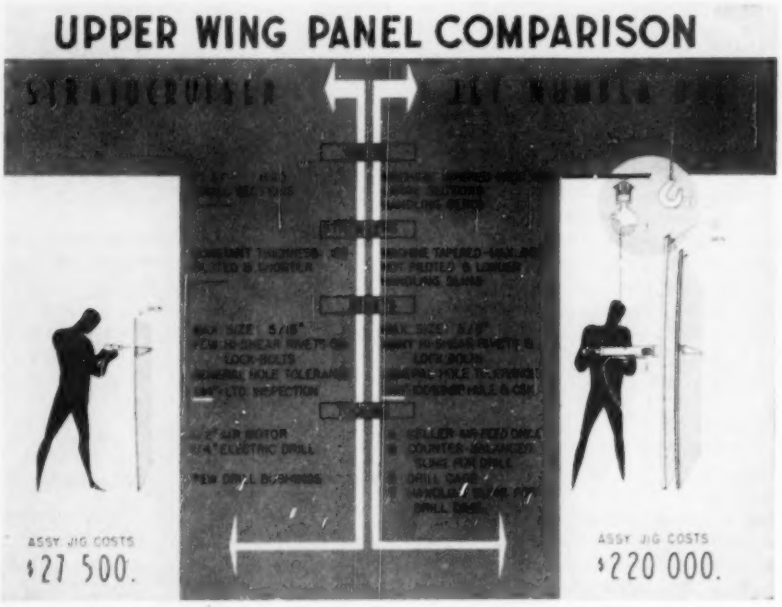
ADAMS-RITE MANUFACTURING CO.

140 WEST CHEVY CHASE DRIVE, GLENDALE 4, CALIFORNIA, U. S. A.

Midwest Representative George E. Harris & Co.
Municipal Airport, Wichita, Kansas
Offices: St. Louis, Kansas City, Ft. Worth

Canadian Representative
Railway and Power Engineering Co., Montreal
Offices throughout Canada





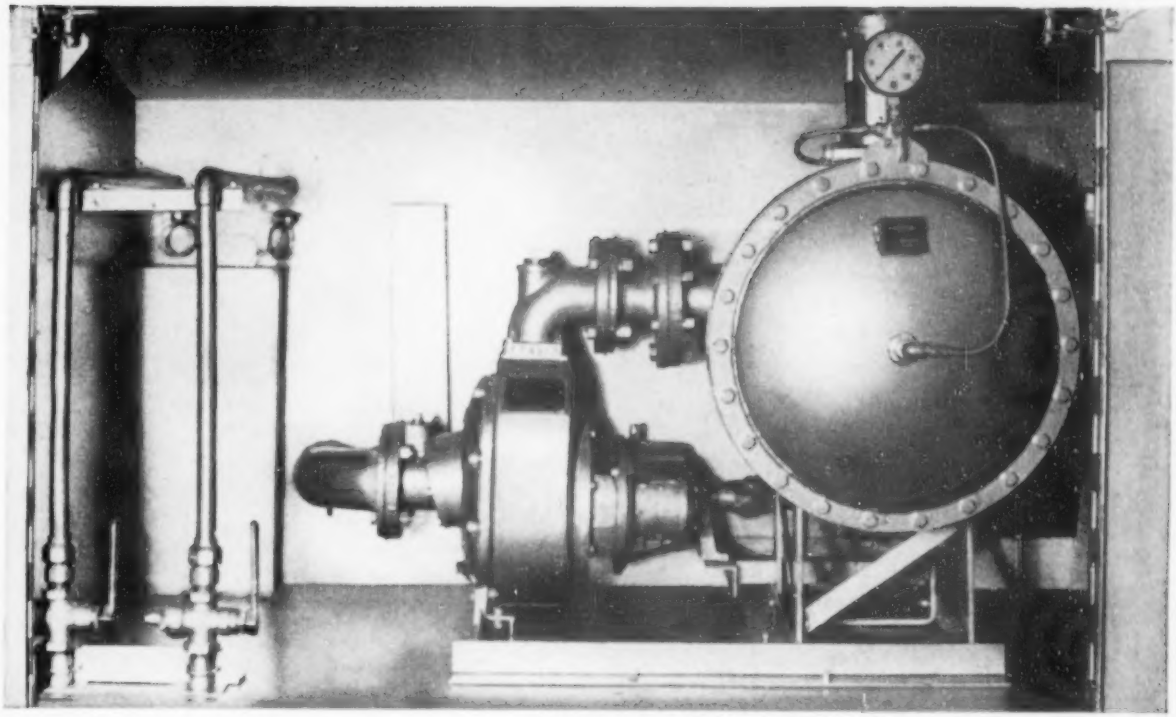
tural members, increased aerodynamic smoothness, and extreme weight-conscious designs, have required more and heavier tools to hold necessary tolerances, yield reasonable interchangeability, and permit complex construction by manpower of normal skill.

► **Plane Example**—In 1939, a 90,000-lb.-empty-weight plane would have been engineered and tooled for about $14½-million; in 1949 it would have been engineered and tooled for about $29¾ million, Barton says.

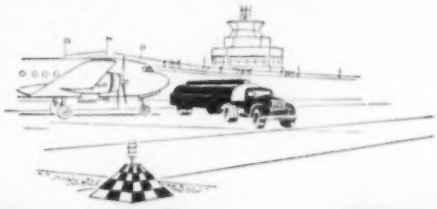
The 1939 plane would not fly as fast, as far, as high, or carry as much payload as the 1949 aircraft, and it would not have been as comfortable. But under the 1949 conditions, the manufacturer incurs a substantially greater first cost, before any planes are produced. This means a much greater financing problem. It means that the manufacturer's decision to base his price on a certain quantity becomes just about twice as important as it used to be, Barton says.

Had the manufacturer chosen to base his price on a quantity of 75 airplanes in both cases, and succeeded in selling only 70, he would on this alone have lost $960,000 in 1939, against a loss of over $2 million in 1949.

In the event of changes in design, more dollars worth of engineering and tooling would be scrapped and more dollars worth of engineering and tooling be required to make the correction than



A typical high-flow Purolator Filter installation as used in handling aviation gasoline and jet fuels. The tank at the right contains 24 Purolator Micronic filter elements which remove particles *sub-microns* small (.0000039 in.).



Your best way to cut meter maintenance costs—

PurOlator Filters for bulk fuel handling

When dirt-clogged meters put your tanks or trucks on the "down list," you lose in *two* ways. Your investment is tied up. And your service suffers.

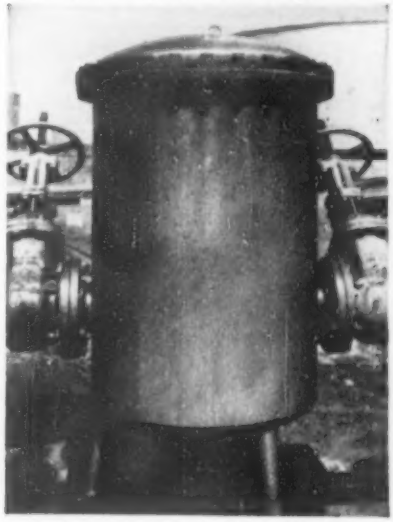
A sure way to reduce such losses is to install Purolator* Filters on *every* truck . . . at *every* platform outlet. Purolator Filters, with famous Micronic* elements, remove particles as small as .0000039 in., have up to *12 times* the filtering area and dirt storage capacity of old-style filters . . . take up *less* space, for the same flow capacity.

One refinery reports that Purolator Filters have more than paid for themselves in a few months by reducing meter maintenance costs.

Take the first step towards more trouble-free operation by sending for the new Purolator Industrial Catalog No. 1053, describing filter units with flow capacities of 15 to 1500 g.p.m.

*Reg. U.S. Pat. Off.

A Purolator filter, pedestal type, for large-capacity fixed installations. Standard models are available with flow rates of 300 to 1500 g.p.m., handling light petroleum products.



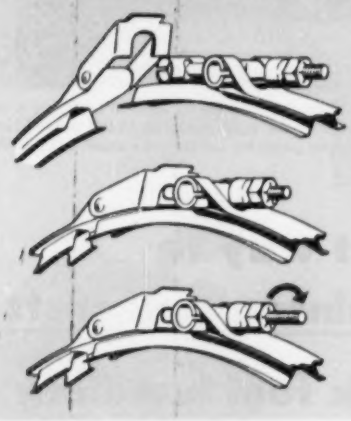
PUROLATOR PRODUCTS, INC.
Rahway, New Jersey and Toronto, Ontario, Canada.
Factory Branch Offices: Chicago, Detroit, Los Angeles.

PUROLATOR
WORLD'S FINEST OIL FILTER

Speed up production

with MARMAN *Quick* Coupler Latches

Exclusive Swivel Action...No loose parts...



Quick TO OPEN

Quick TO CLOSE

Quick TO TIGHTEN

Positive Lock Under All Conditions

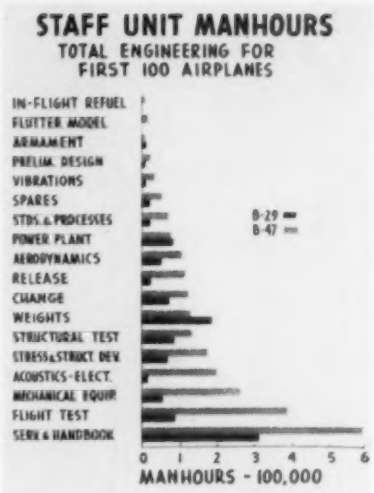
Not affected by heat, cold, vibration or stress

These time-saving features are available on the standard line of Marman precision couplings—easy to specify—fast on delivery

For catalog or information, write Dept. W-5

MARMAN PRODUCTS CO., Inc.
11214 EXPOSITION BLVD.
LOS ANGELES 64, CALIF.

3-429



for the period of the 1930s. This means use of planning and methods study personnel to avoid these costly changes.

▶ **Production Aspects**—Broadly defining structural efficiency as the pounds of gross weight per pound of structural weight, Barton points out that Model 1933 carried 2.03 lb. of gross weight per pound of structure, Model 1939 carried 3.54 lb. and Model 1949 carried 3.9 lb.

This means that during the period a 92% increase in structural efficiency was obtained against a 49% increase in cost per pound of empty weight.

From Model 1939 to Model 1949 there was a practically negligible increase in production labor costs. The increase was kept relatively small by very substantial decreases in structural cost per pound—the manufacturers became increasingly proficient in working the new materials available. Boeing records indicate better than a 28% decrease in manhours per pound of structure for this period.

While percentage of airplane weight accounted for by installation items increased only slightly during this period, manhours per pound for this nonstructural material increased by more than 60%. This led to employment of time and methods study techniques, increased production planning and better tooling techniques.

The combination of these factors brought about the relatively minor increase in labor cost per pound.

▶ **Overhead's Role**—Production overhead is responsible for the greatest single increase in production costs from Model 1933 to Model 1939—more than 73%. Generally speaking, overhead costs consist of those items that cannot practicably be charged directly to any given product.

Barton has two major reasons for the overhead increase:

• The very fact that a large type of or-

THE INSIDE REASON

Why the Wilcox 96 Series Transmitting Station is in Use All Over the World

Dependability! Flexibility!

- Advanced design—using hermetically sealed meters, transformers, capacitors for unfailing dependability.
- Unit construction provides for either simultaneous transmission on a number of frequencies, or selection of an individual frequency best suited to your particular communication problem.

2 kc – 425 kc/s 2 – 26 mc/s
200 watts 2500 watts

wilcox

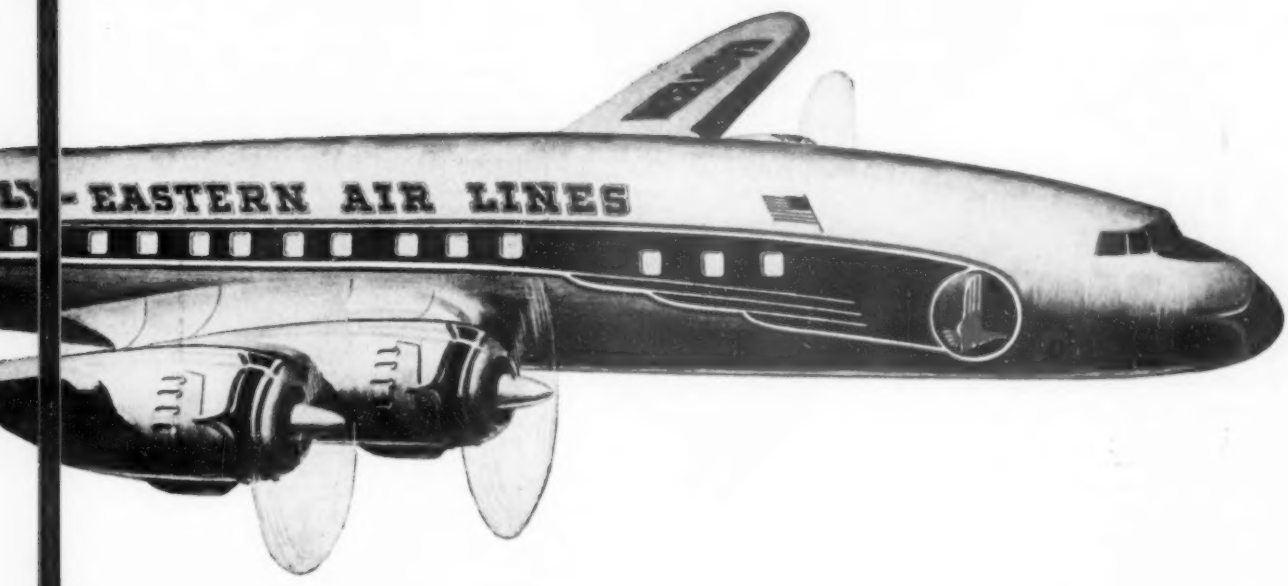
ELECTRIC COMPANY, INC.

Fourteenth and Chestnut

Kansas City 27, Missouri, U. S. A.

EASTERN'S Experience

INSPIRES Confidence



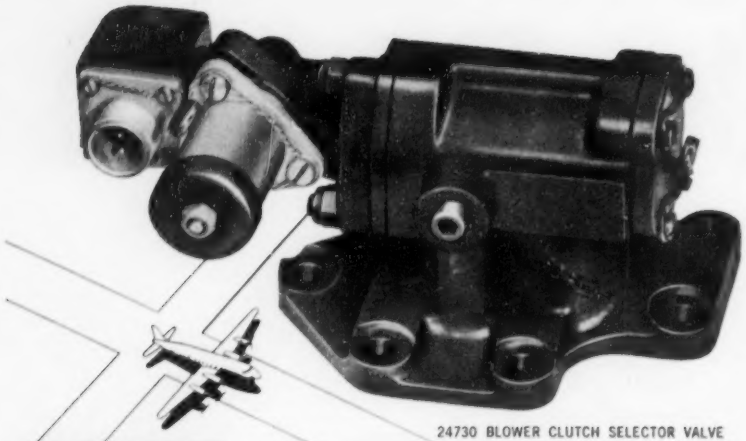
Eastern relies on Sinclair for Dependable Engine Lubrication

Last year 3,908,371 passengers placed their confidence in the powerful engines of Eastern Air Lines. And mile after thundering mile, these engines have relied on Sinclair Aircraft Oil for maximum protection against heat and friction. Eastern has shown its confidence by using Sinclair Aircraft Oil exclusively for four years!

Airlines maintain public confidence by using the finest, most dependable products available. *Over 45%* of the aircraft oil used by major airlines in the U. S. is supplied by Sinclair. Only a high quality aircraft oil which has been severely tried and proven could make and *keep* a record such as this. Why not place *your* confidence in Sinclair Aircraft Oil?

SINCLAIR AIRCRAFT OILS

SINCLAIR REFINING COMPANY, AVIATION SALES, 600 FIFTH AVENUE, NEW YORK 20, N.Y.



24730 BLOWER CLUTCH SELECTOR VALVE
For use on Pratt & Whitney R-2800 engine.
Controls operation of two-speed supercharger. Electrical control is positive in action. Current failure returns valve to normal position, placing supercharger in low gear.
Weight: 2.2 lb.

ADEL

ENGINE ACCESSORIES

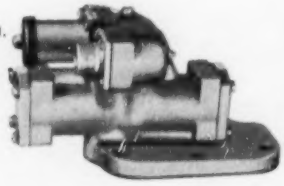
Precision-Built . . . Performance-Proved . . .

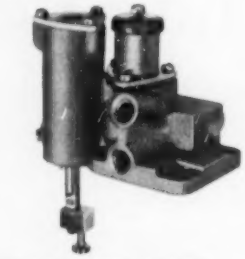
USED BY MAJOR AIRLINES AND AIRFRAME MANUFACTURERS

Valves and actuators you can specify with confidence. Provide fail-safe operation in case of electrical failure. Light weight.

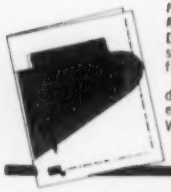
Operating fluid: Engine Oil.
Duty: Continuous.
Solenoid: Single-coil, internally grounded.
Electrical Range: 18 to 30 volts dc.
Current drain: 0.5 amp at 24 volts.
Corrosion resistant construction.

24793 SUPERCHARGER CONTROL ACTUATOR
For use on Wright R3350-30 engine.
Provides positive control of two-speed supercharger with complete immunity to pressure surges in the operating fluid. Durable and dependable.
Weight: 1.75 lb.





26153 SUPERCHARGER CONTROL VALVE
For use on Pratt & Whitney R4360-63 engine.
Directs oil flow from pressure supply to high blower. Rated flow—9 gpm.
Built-in stamina provides dependable performance under extreme vibration conditions.
Weight: 1.9 lb.



25805 SUPERCHARGER ACTUATOR
For use on Wright R1820-103 engine.
Converts hydraulic pressure to mechanical push-pull actuation. Electrically controlled. Combines reliable operation with proven design . . . rugged construction.
Weight: 1.95 lb.

Write for new, descriptive Brochure containing detailed information on ADEL's line of Aircraft Equipment and facilities. Address ADEL DIVISION, GENERAL METALS CORPORATION, 10775 Van Owen St., Burbank, Calif.

ADEL produces a complete line of Aircraft HYDRAULIC & PNEUMATIC CONTROL EQUIPMENT, HEATER, ANTI-ICING & FUEL SYSTEM EQUIPMENT, ENGINE ACCESSORIES AND LINE SUPPORTS.

ADEL PREFERRED FOR AIRCRAFT THE WORLD OVER

DIVISION OF GENERAL METALS CORPORATION • BURBANK, CALIF. • HUNTINGTON, W. VA.

CANADIAN REPRESENTATIVE: RAILWAY & POWER ENGINEERING CORPORATION, LIMITED

ganization is required to build heavy aircraft today helps build up overhead. A large organization is not necessarily a desirable thing, Barton admits, but it has proven to be a necessary thing in view of the tremendous amount of direct work to be accomplished by the primary airplane and equipment suppliers despite efforts to spread this work to smaller contractors.

Military demand is another reason why the aircraft industry has grown large. But Barton says: "While we may bemoan the increased overhead costs occasioned by military demand . . . had it not been for these demands, the frontier of practical knowledge would certainly not have been advanced to its present position today."

• Additional planning is a second major contributor to increased overhead. For example, material procurement has become much more difficult in view of the continuously increasing quantity of materials and the need for establishing adequate controls over quality, schedule and costs with a tremendously increased number of vendors.

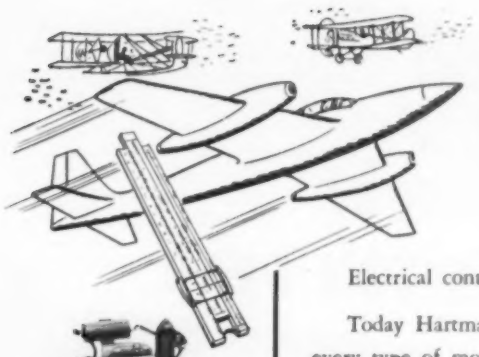
The number of parts per airplane during this long period has increased from about 20,000 to about 40,000—pointing up the increased requirements for planning, storage, and control of inventories. During the war, it was found that relatively small expenditures of overhead money in methods and sequence planning could produce remarkable direct labor savings, so these functions have been greatly increased.

► **Inspection and Control**—Inspection and quality controls have increased by more than double the average for all overhead. Stricter tolerances, more specifications, increased number of inspections required per airplane simply because of the greater number of parts, have all contributed to this increase. Inspection techniques used today were unheard of in the 1930s.

Raw material cost, while steadily increasing, has done so at a rather normal rate.

On the basis of engine cost per sea level brake horsepower, there is a steadily reducing trend after adjusting for inflation. This means that while the powerplant has contributed to the increased cost per pound of empty weight, a real gain in efficiency has been made—more power per dollar is being obtained for Model 1949 than was obtained for Model 1933.

► **Equipment Complications**—Cost of purchased equipment other than engines and propellers now equals cost of raw materials. Equipment increase is more than 145%—greatest of any of the production elements. The reason for this change is in the inherent cost increase of the equipment itself, its effect on production labor and overhead requirements, and its reflection on the

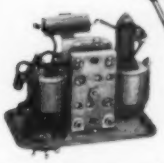


RIGHT
from the beginning

Electrical controls are Hartman's business . . . and have been for over 50 years.

Today Hartman makes relays, cutouts or contactors for nearly every type of modern, high-speed aircraft, both multi-engine transport and military jet. Hartman designs, engineers, develops, and produces these highly specialized controls in its own plant.

So if you have a problem involving electrical control—*either AC or DC*—turn it over to Hartman where it will be analyzed and engineered with an efficiency that comes from half a century of controls specialization. Then you'll know you'll be Right—from the beginning. A-7266



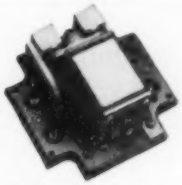
Phase Sequence and Phase Failure

400 Cycle Under-frequency Relay

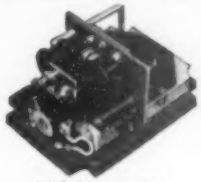
the Hartman Electrical Mfg. co.

"CONTROL HEADQUARTERS"

MANSFIELD, OHIO

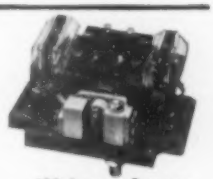


600 Ampere Contactor

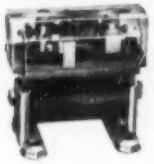


High Interrupting Capacity Cutout

USAF Type T-1 High Interrupting Capacity Contactor

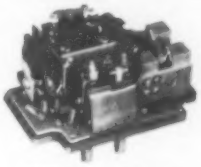


600 Ampere Reverse Current Cutout AN3025-2

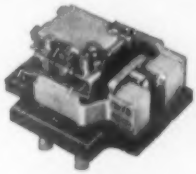


Control Relay *(without cover)*

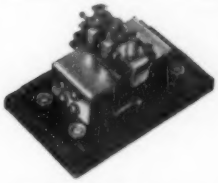
Equalizer Relay



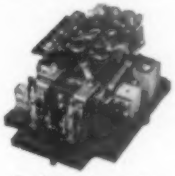
1000 Ampere Reverse Current Cutout



Jet Starter Relay

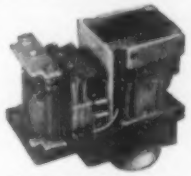


Undercurrent Relay

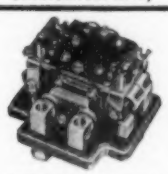


Fault Sensing and Generator Control

Overvoltage Relay



Generator Field Relay or Exciter Control Relay



300 Ampere Reverse Current Cutout AN3025-1

HARTMAN ALSO MANUFACTURES

Polarized Relays • Selector Relays • AC and DC Contactors • Differential Relays • Fault Relays • Time Delay Relays • Automatic Paralleling Relays • Reverse Power Relays • Complete Control Assemblies

aircraft control systems by WESTERN GEAR

....WING-FLAP system

a motor
b center gear box
c indicator or control
d torque tubes
e right angle or "T" gear box
f couplings
g jack screws
h traveling nuts
l links

WESTERN GEAR WORKS service to the aviation industry includes the design, manufacture and testing of complete control systems for all types of aircraft.

Highly specialized knowledge gained by more than two decades of power transmission service to the aviation industry assures you of the *correct* answer in a quality product designed for complete dependability.

Other products and services include actuators, accessory drives, special gears and gear units, test equipment for laboratories, research and wind tunnels.

"GEARING FOR THE AGE OF FLIGHT"
Send for your copy of new treatise now. Please use company letterhead.

Write, wire or phone your nearest Pacific-Western office

Plants—417 Ninth Ave. S., Seattle 4, Washington
2600 E. Imperial Highway, Lynwood (Los Angeles County), California
1035 Folsom St., San Francisco 3, California
Belmont (San Francisco Peninsula), California
117 N. Palmer St., Houston 3, Texas

Representatives—N. 2605 Division St., Spokane, Washington
930 S. E. Oak St., Portland 14, Oregon
Room 212, Ross Bldg., Denver 2, Colorado
500 South Ervay Street, Dallas, Texas
Engineering & Machinery Ltd., 1366 W. Broadway, Vancouver, B.C.

65th

WESTERN GEAR WORKS
Manufacturers of **PACIFIC-WESTERN** Gear Products
Pacific Gear & Tool Works

Plants: Seattle
San Francisco
Belmont (S. F. Peninsula)
Lynwood (Los Angeles County)
Houston

added complexity of engineering and tooling.

Barton observes that while the weight attributed to this type of equipment for Model 1949 was only slightly greater percentage-wise than it was for Model 1933, the complex and important function assigned to it makes necessary special consideration throughout the whole manufacturing organization. New techniques of handling, storing and functional testing had to be developed.

Barton says that the purchased equipment element and "its related effects" present one of the greatest, if not the greatest, threat of increased airplane prices.

▶**B-29 vs. B-47**—Barton compares the history of B-29 engineering staff manhours against B-47 engineering staff manhours. The chart on page 52 shows that in almost every case the B-47 staff manhours were at least twice as great as the B-29 manhours. This illustrates, says Barton, the type of problem, engineering-wise, that the jet age has developed.

Of the various staff units shown, one of the smallest differences between the two planes occurred in the powerplant unit. While this indicates the simplicity of the jet engine and its installation, it also shows that the effect of changing from a piston-driven to a jet-driven aircraft is not localized in the powerplant area.

Actually, says Barton, this becomes one of the relatively smaller problems. It is the increased performance, which the jet makes possible, that develops problem areas in each of the specialized fields where existing research and production techniques are insufficient to supply the needed answers.

In electronic equipment, the number of systems has increased 55% from the B-29 to the B-47. Number of vacuum tubes has jumped 333%. Electronic equipment weight has increased 371%. Barton says that while it is probable that a longer step forward for the military requirements has been made than will be required for the commercial situation, a substantial increase in electronic equipment will be needed.

▶**Jet Factors**—Barton compares the Model 1949 upper wing panel with its counterpart in Jet No. 1 (Barton's Jet No. 1 closely resembles the Comet 3).

The 1949 plane has relatively small sections of flat .060 sheet as against machine-tapered skins as thick as .4 in. for the jet. He says these skins become so large that they must be handled by overhead equipment.

Stringers for the 1949 planes were sheet metal and had a constant thickness of .125 in. They were piloted in the fabrication operation and were short enough to be manhandled. Jet stringers are made from extruded sections with ½-in. thicknesses that are machine-tapered full length. These are long and heavy enough to require a sling.

Rivets are necessarily heavier and many high-shear rivets and lock bolts will be used for structural efficiency on Jet No. 1.

A Class 2 hole (.014 in. tolerance), which required little inspection, was used for 1949, but for Jet No. 1 a Class 1 hole (.003 in. tolerance) will be used. This hole requires precision inspection and must be countersunk.

For the 1949 model, a standard ½-in. electric drill plus a ½-in. air motor and relatively few drill bushings were required; for Jet No. 1, due to the thickness of material and the tolerance of the hole, automatic air feed drills which must be counter-balanced from overhead are needed. A drill cage to position the drill and locate the hole must be built and a sling must be provided to move the drill cage into and out of position. The final assembly jig for Jet No. 1 is estimated to cost nearly eight times as much as the assembly jig for Model 1949.

Barton concludes that the trend of non-recurring costs toward being a greater and greater percentage of the total will continue into the future.

▶**Powerplant Price**—Considering powerplants, Barton reports that for a jet airliner, recent quotations indicate the

Narrow, Floating

5/16-24 and 3/8-24

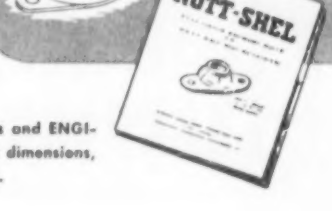
ANCHOR NUT

Nutt-Shel

Manufacturers of self locking anchor nuts and bolt and nut retainers.

811 AIRWAY, GLENDALE, CALIFORNIA

Citrus 4-4191 CHapman 5-3693



3600 SERIES

Floats 1/32" in all directions. Narrow AN366F-AN362F envelope. Maximum torque out and push off strength. Meets applicable requirements of specification AN-N-10. All metal • *(cadmium plated carbon steel);* also all *stainless steel* available as 3700 series.

Sizes: *All standard sizes 6-32 through 3/8-24.*

WRITE FOR SAMPLES

Write on your letterhead for samples and ENGINEERING MANUAL. Manual contains dimensions, tolerances and material specifications.

engine price should be in the neighborhood of $460,000. For an 86,000-lb.-empty-weight airplane, this would yield $5.35 per weight empty pound as compared with $3.50 for the Model 1949 powerplant installation.

A substantial increase, Barton observes.

▶ **Price Guess**—Barton makes an "informed guess" on the order of magnitude of jet transport prices for the future on the basis of (pound of gross weight) vs. (gross weight times block speed).

Historical data were plotted against every conceivable parameter, Barton says, and this particular basis provided the most meaningful relationships.

Assuming that Jet No. 1 is going to have a gross weight of about 186,000 lb. at a block speed of 460 mph., Barton multiplies these two factors and finds the point of intersection with the projected trend line for Models 1933, 1939 and 1949. This indicates a price for the jet of $24.50 per lb. of gross weight, which when multiplied by 186,000 lb., yields a total price of $4.56 million.

He says that since previous history indicates a quantity of 75 airplanes, we then have a number which represents a possible average price for this number of planes.

Barton puts it this way: "We certainly cannot represent this number as being very precise. It should, however, be at least 'in the ball park.' It is undoubtedly not 'in the diamond' and furthermore we should recognize that this represents a straight projection of past trends."

He doesn't represent this estimate as any particularly deep and searching one, rather as one to use simply as an indication of trend and to spur efforts toward cost reduction. It is entirely possible that experience of aircraft manufacturers in building jets, plus their efforts to reduce costs may result in lower prices, Barton points out.

It is also possible that problems of such magnitude may arise that they cannot be solved for this price. He observes that the price is below that "quoted" for the Comet No. 3 as converted to U.S. wage scales.

This developed price converts to 11.5¢ per pound of weight empty per mile per hour, versus more than 15¢ per pound per mile per hour for Model 1933—or a reduction of 26% in terms of a price based on speed capability.

▶ **Changes Cost Money**—Barton contends that both the airlines and the manufacturers should strive to minimize changes from the basic design. "A book could be written on the subject of changes," he says, classifying them as CAA and CAR, customer, contractor, and vendor. He claims that changes in the first three categories can well make or break a project.

• **CAA changes** on the Stratocruiser added hundreds of pounds to the empty weight of the airplane and cost many thousands of hours, he points out.

• **Customer changes,** he says, are extremely difficult to control, adding that while the airlines all talk a good game of standardization, it has seldom been practiced.

• **Engineering changes** originated by the contractor are within his control, but still are somewhat of a menace to low cost. The contractor must learn to evaluate better the cost of a change versus the increment of improvements, Barton insists.

It is almost impossible to evaluate the disrupting influence of a change and the effect it has on the cost of the basic article as reflected on the learning curve, Barton says. And bad as changes from the basic specification are, changes between customers' specifications are disastrous.

▶ **Stratocruiser Experience**—On the Stratocruiser program, which involves six initial customers and 55 planes, the airlines demanded these major changes: three basic cockpit configurations, six arrangements of instrumentation, five different window configurations, two types of propellers, three basic galley arrangements, six different berths and

trained hands reach for precision-made instruments

Microtomic

Only Microtomic gives you all these features:

- **HI-DENSITY LEADS** Lines are opaque to actinic rays of high speed 'printers'.
- **ABSOLUTELY UNIFORM** Every Microtomic of the same degree marking is identical.
- **NEW DUSK GRAY** Scores of professional men acclaimed it the best color for a drawing pencil.
- **BULL'S EYE DEGREE MARKING** Easier to read . . . quicker to find—positive identification.
- **ALSO**—Choice of Holders and Microtomic Drawing Leads.

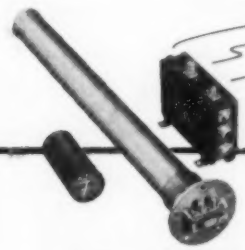
Designed especially for engineers and draftsmen, precision-made MICROTOMIC Drawing Pencils meet every requirement. The result of over a century of pencil-making "know-how" backed by constant Eberhard Faber research. See the difference—prove it to your satisfaction!

Compare any of Microtomic's 18 degrees in your own drafting room. To make this test easy and without cost—write us for a sample (specify degree wanted).

EBERHARD FABER

since 1849

Helping Sharpen the Edge of CUTLASS over MIG



PACITRON

ELECTRONIC FUEL GAGE CLIMAXES 10 YEARS OF DEVELOPMENT

Simmonds first introduced the highly accurate capacitance-type fuel gage to the U.S. aviation industry. In 10 years of development, consistent refinements have cut weight, simplified installation and increased ruggedness.

■ The new F7U-3 Chance Vought Cutlass is one of the Navy's fastest flying, fastest climbing production fighters. This twin jet has a doubly keen edge over the MiG – in high speed performance, and in the components and mechanisms that bring pilots back safely with missions accomplished.

Like each of its predecessors in the F7U series, the Cutlass is equipped with Simmonds capacitance fuel gages . . . accurate, space-saving, weight-saving, more rugged than ever.

Manufacturers who specify Simmonds fuel gaging systems get more than dependable equipment. They can count on the advantages of a nationwide service organization. This includes comprehensive manuals and charts and continuous on-the-spot engineering assistance. Simmonds engineers worked at Chance Vought in developing the Cutlass installations and are completing details of a fuel gage service school for personnel of both Chance Vought and the Navy.

More than 40 types of military and commercial aircraft rely on Simmonds – first in electronic fuel gaging.

Simmonds

AEROCESSORIES, INC.

MAIN OFFICES: Tarrytown, N.Y.

Branch Offices: Glendale, California • Dayton, Ohio • Dallas, Texas

Manufacturing Divisions: Vergennes, Vermont • Danbury, Conn.

Sole Canadian Licensee: Simmonds Aerocessories of Canada, Ltd.

seating layouts, 12 different versions of interior styling, and 20 versions of radio and navigation equipment.

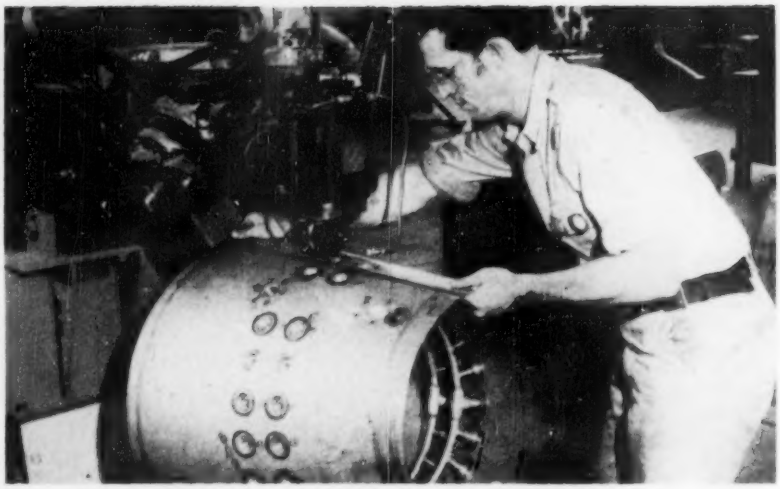
Nearly one-third of Boeing's total loss on the Stratocruiser is attributed to cost over-run on changes. Barton says that on the jet Project "X" Boeing is following SAE recommendations wherever possible and hopes to use this level to achieve more standardization.

▶ **Price Cutters**—This prescription was offered by Barton to decrease airplane sales prices dramatically:

- **Minimize changes** from basic specification.
- **Eliminate all but most minor** variations between airplanes for different customers.
- **Minimize use** of unproven equipment.
- **Minimize luxury accommodations.**
- **Pool purchases of aircraft and spares.**
- **Order spares early** enough to permit concurrent production with aircraft parts.

The first four of these items apply equally to airlines and manufacturers, Barton says. Somewhat sadly, he observes that like most patients they have known all along that this is the way to reduce. But the willpower to push away from the drawing board and typewriter needs stimulation.

—Irving Stone



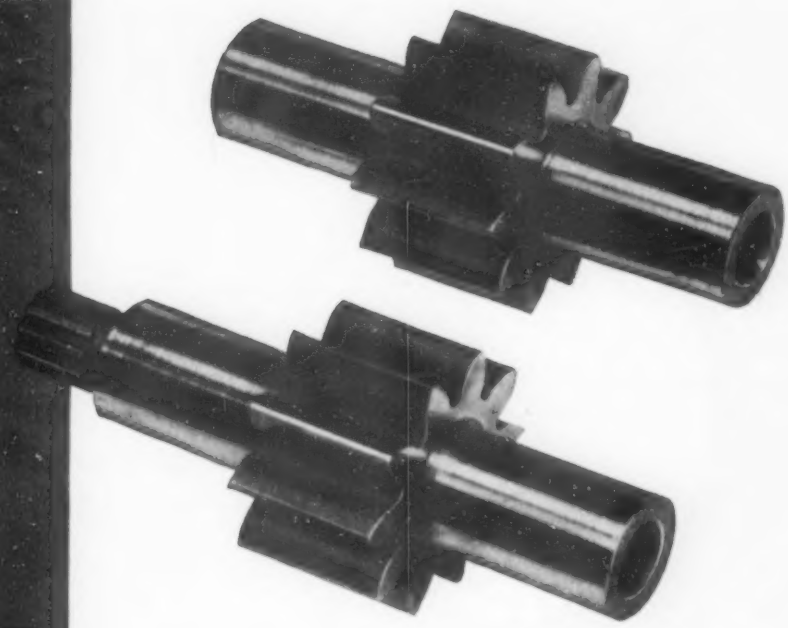
Solar Rollwelder Cuts Jet Costs

Big savings are being realized on Solar Aircraft Co.'s San Diego production line with a new welding machine. Economies realized add up to less processing time, fewer operators and equipment savings.

Solar developed its new rollwelder to boost the efficiency of resistance-welding operations. It is using the tool for making circular seamwelds in joining afterburner fuel manifolds to General Electric J47 exhaust cones. In this job, a single rollwelder—designed and built at a cost of $14,000—replaces seven spotwelders, costing a total of $49,000.

This changeover reduces manpower to one operator where seven formerly were needed. In addition, there is a cut of more than three hr. in welding cycle time. Formerly the welding oper-

"THEMI" THEODOLITE NO. 120. "Most satisfactory . . . superior workmanship," says U. S. Army Ordnance expert.
"NITAC" LEVEL NO. 24. World's only level with split-bubble. Erect image.
ACCURACY AND QUALITY
FENNEL
PERFECTED THROUGH 102 YEARS
NEW! CROSS-TABLE adjusts perfectly for height and cross movements, replacing makeshift methods.
"UNIVERSAL" WYE LEVEL NO. 100. Internal focusing telescope with 32X magnifying power.
"PLANI" PRECISE LEVEL NO. 35. Incomparably accurate. Average error can be limited to ±0.2 mm. to ±0.6 mm. per 3280 ft.
"6¼" TRANSIT. Non-magnetic parts, coated optics, hermetic sealing—like all Fennel-quality instruments.
For Optical Tooling
FENNEL INSTRUMENTS
reflecting a century of progress
In fine instrument-making, nothing counts so much as human skill . . . and Fennel's old-world craftsmen have the skill of generations.
That is why, no matter how exacting your standards, these instruments will meet them. Proved in 58 different countries from equatorial Brazil to arctic Alaska . . . Before you decide, compare Fennel. Particulars and prices on request.
REPAIR SERVICE by Factory-Trained personnel. Surprisingly thrifty!
CONTACT THESE DEALERS
BOSTON: Modern Blue Print Co., 47-51 Cornhill Street
TRENTON: D & W Blue Print Co., 16 Perry Street
TOLEDO: The L. Beckmann Co., 1609 Canton Street
DETROIT: The Ostermann Co., 2222 Woodward Avenue
CHICAGO: Crofoot, Nielsen & Co., 205 Wacker Drive
or write direct to us
FENNEL INSTRUMENT CORP. OF AMERICA • 478 Water Street, New York 2, N. Y.



ONLY 2 MOVING PARTS

do the pumping in a Pesco Hydraulic Pump

This SIMPLICITY OF DESIGN is important for these reasons!

- ***reliability—less chance of pump malfunction***
- ***less maintenance***
- ***less cost for overhaul***
- ***less weight . . . less noise***

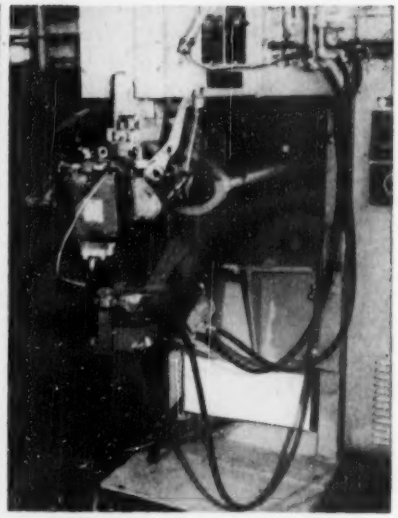
Add *Pesco Simplicity of Design* to Pesco's *exclusive*, patented "Pressure Loading" principle, which results in volumetric efficiencies up to 97% and torque efficiencies up to 90%, and you have two important reasons why so many industrial and aircraft manufacturers have standardized on Pesco pumps.

engineering Pesco production

PRODUCTS DIVISION

BORG-WARNER CORPORATION

24700 NORTH MILES ROAD • BEDFORD, OHIO



CLOSEUP of Solar rollwelder unit.

ation took four hr.; now it takes 45 min.–a time saving of almost 80%. Handling of parts also has been reduced.

▶ **Operation**–Solar's rollwelder makes a 3-in. diameter seamweld around the support bosses of the fuel manifold. The welder head–upper electrode of the tool–automatically moves around a circular path, while the work remains stationary.

This upper electrode carries about 14,000 amp. through a ½-in. diameter shaft and floating joint. The lower electrode is essentially an air-operated clamping fixture. After the work is positioned and the lower electrode closed, the welding operation is completely automatic. Welding speed is adjustable from 8 to 48 in./min.

▶ **Versatility**–The upper electrode's circular path may be varied from 0 to a 6-in. radius for versatility in welding operations. In less than a half hr., the special tooling can be replaced by conventional tooling to make the machine a standard universal (circumferential or longitudinal) seamwelder.

The Solar-designed machine–built by Taylor Winfield Corp.–is a medium series, 36-in.-throat, 150-kva. transformer, low-inertia-head unit.

"Now viewers, the pilots will explain how the Comet and helicopter differ in flight."
IEA Magazine

NOW! simplify fuel tank repair jobs with easy-to-use 3M sealant kit

Yes, now you can seal integral fuel tanks quickly, easily and effectively . . . and you can fulfill many small quantity production line uses . . . with 3M's new Quick Repair Sealant Kit.

Designed expressly for this vital assignment, 3M's Sealant Kit complies with MIL-S-7502, which supersedes Air Force Specification 14153 and Air Force Technical Order 01-1-3.

For more detailed information on 3M's Quick Repair Sealant Kit, its preparation and application . . . for additional information on other 3M products made for the aircraft industry, consult with your 3M sales representative. There's one located near your plant. Call him in, or write directly to 3M, Dept. 115, 411 Piquette Avenue, Detroit 2, Michigan.

3M COMPANY

SEE HOW EASY IT IS TO MAKE QUICK REPAIRS WITH 3M'S SEALANT KIT

1 Use the spatula to stir the accelerator (small jar) to a creamy paste.

2 Scrape ALL the contents of the small jar into the large jar (sealant).

3 Mix the accelerator and the sealant in the larger jar with the spatula.

4 To obtain uniform dispersion, stir for approximately 5 minutes.

5 Sealant may readily be applied to a surface that is chemically clean.

6 Sealant must be topcoated. 3M's EC-776R fills Spec. MIL-S-8343.

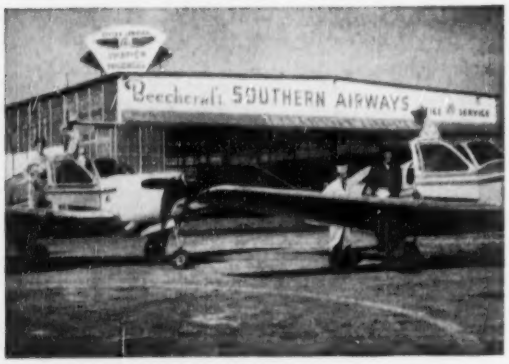
ADHESIVES·COATINGS·SEALERS
for the Aviation Industry

MINNESOTA MINING AND MANUFACTURING COMPANY
ADHESIVES AND COATINGS DIVISION • 411 Piquette Ave., Detroit 2, Michigan
GENERAL SALES OFFICES: ST. PAUL 6, MINN. • EXPORT: 122 E. 42 ST., N.Y. 17, N.Y. • CANADA: LONDON, ONT.

MAKERS OF "SCOTCH" BRAND PRESSURE SENSITIVE ADHESIVE TAPES • "SCOTCH" BRAND SOUND RECORDING TAPE • "SCOTCHLITE" BRAND REFLECTIVE SHEETINGS • "3M" ABRASIVE PAPER AND CLOTH • "3M" ADHESIVES AND COATINGS • "3M" ROOFING GRANULES • "3M" CHEMICALS

SOUTHERN AIRWAYS AT ATLANTA, GEORGIA. Popular service stop-over for many industrial, executive, corporation and personal planes heading for Florida from Midwest and Northwest.

Popular, Dependable Service-Point For Many Florida-Bound Aircraft



ARMY FIELD FORCES SCHOOL at Southern Airways, Atlanta, teaches instrument flight training to Army Aviators of 3rd Army, Fort McPherson, Georgia.

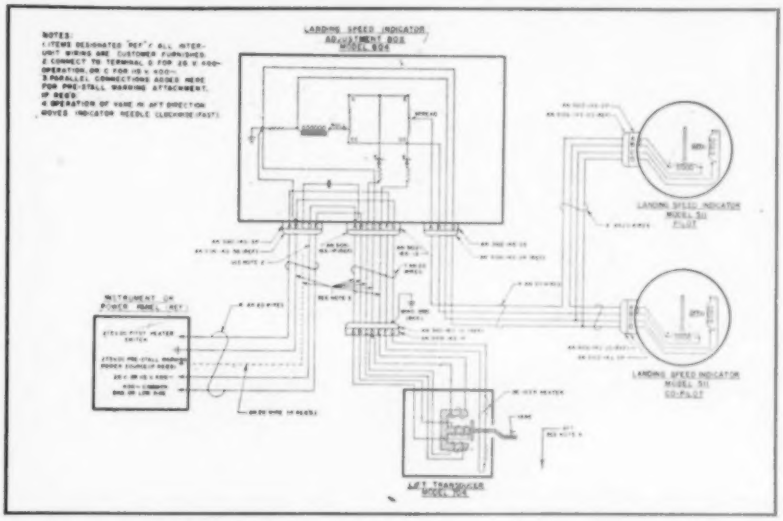
Southern Airways at Atlanta And Birmingham Services More Businessmen's Aircraft Than Any Other Fixed Base Operation In Southeast! . . . With Cities Service Aviation Products!

Here's another spot on the airmap of America where a top-flight aircraft service organization relies on the consistent high quality and ultra-dependability of Cities Service Aviation Products.

Southern Airways service facilities include Radio Shops and approved CAA Repair Stations. They are also the leading distributors in dollar volume of Beech Aircraft and parts.

Wherever you fly through the Southeast, make Southern Airways your service stop. You'll always be assured of the highest quality service with America's finest Aviation Products . . . the complete line of Cities Service Aviation Products.

CITIES SERVICE
AVIATION PRODUCTS



LANDING SPEED INDICATOR uses vane transducer to detect airflow changes.

LSI Tells Pilot Best Airspeed

New wing airflow measuring system 'makes a smooth pilot out of anybody,' Safe Flight company claims.

By George L. Christian

A new aircraft flight instrument system that continuously tells a pilot if he is flying at an airspeed that is producing the wing's best lift coefficient for landing approaches and takeoffs is being put on the market by Safe Flight Instrument Corp. It is called the Landing Speed Indicator system.

The White Plains, N. Y., firm is currently conducting a series of demonstration flights with its Beechcraft 18. Pan American World Airways is getting one LSI system on consignment for evaluation in a DC-6B. Safe Flight spokesmen say that considerable interest in the system has been expressed by U. S. and Canadian government agencies and by domestic, international and foreign airlines.

▶ **Leading Edge Airflow**—The LSI system measures airflow at wing's leading edge by means of a vane-actuated transducer. This information is relayed to a standard-size Landing Speed Indicator mounted on the instrument panel.

The instrument shows a 75-deg. arc, center of which is marked with a point-down triangle. Left segment of the arc, the slow side, is red; middle part, the correct flying speed range, is white; the right portion, too-fast end of arc, is green.

An indicator needle travels the full range of the arc to tell the pilot what the wing's lift coefficient is. A small red flag marked "off" jumps into place if the system is turned off or malfunctions.

▶ **What It Tells**—The LSI System gives a pilot this help:

• **Takeoff** with this system is a simple procedure, regardless of aircraft weight, wing flap position or wind, Safe Flight says. Bob Jones, the company's chief pilot, gave a convincing demonstration with the company's Beechcraft 18. Assuming that the system has been adjusted to register V_2 speed when the needle is centered on the triangle, the pilot merely watches the Landing Speed Indicator until it hits the triangle, and the plane is ready to fly. Safe Flight spokesmen believe that this feature might have prevented recent commercial jet aircraft mishaps.

On a multi-engine aircraft, should an engine fail at a critical time during takeoff, the instrument will immediately tell the pilot what his optimum rate of climb is. In this case, he keeps the needle set at meeting of white and green sectors of the arc. "The LSI makes a smooth pilot out of anybody," Jones says.

• **In flight,** the needle is normally displaced all the way to the right of the instrument. However, should the plane approach stall speed for any reason, the LSI will register the danger instantaneously. An important advantage Safe Flight cites for its device is its rapidity of operation and lack of lag. (Lag is inherent in pitot-controlled instruments.)

• **In landing,** the pilot merely slows the aircraft down until the needle centers. This means that the aircraft is approaching the field at its optimum airspeed—aircraft weight, wing flap position and landing gear configuration all being automatically compensated for. Last minute mental calculations by the pilot are eliminated. The plane is brought to the landing strip at its minimum safe speed. This means that highspeed landings, with resultant excessive wear on brakes and tires, excessive reverse pitch operation and possible over-shooting of the runway are eliminated.

If approach is too slow, needle moves toward red sector, telling pilot to increase throttles.

Safe Flight cites this example of the critical nature of landing speeds of modern, heavy, clean, jet planes: If Boeing's speedy medium jet B-47 bomber is landed 10 knots above proper landing speed, aircraft uses up 1,700 feet more runway.

Jones demonstrated how the LSI automatically compensated for dirty or clean aircraft configurations.

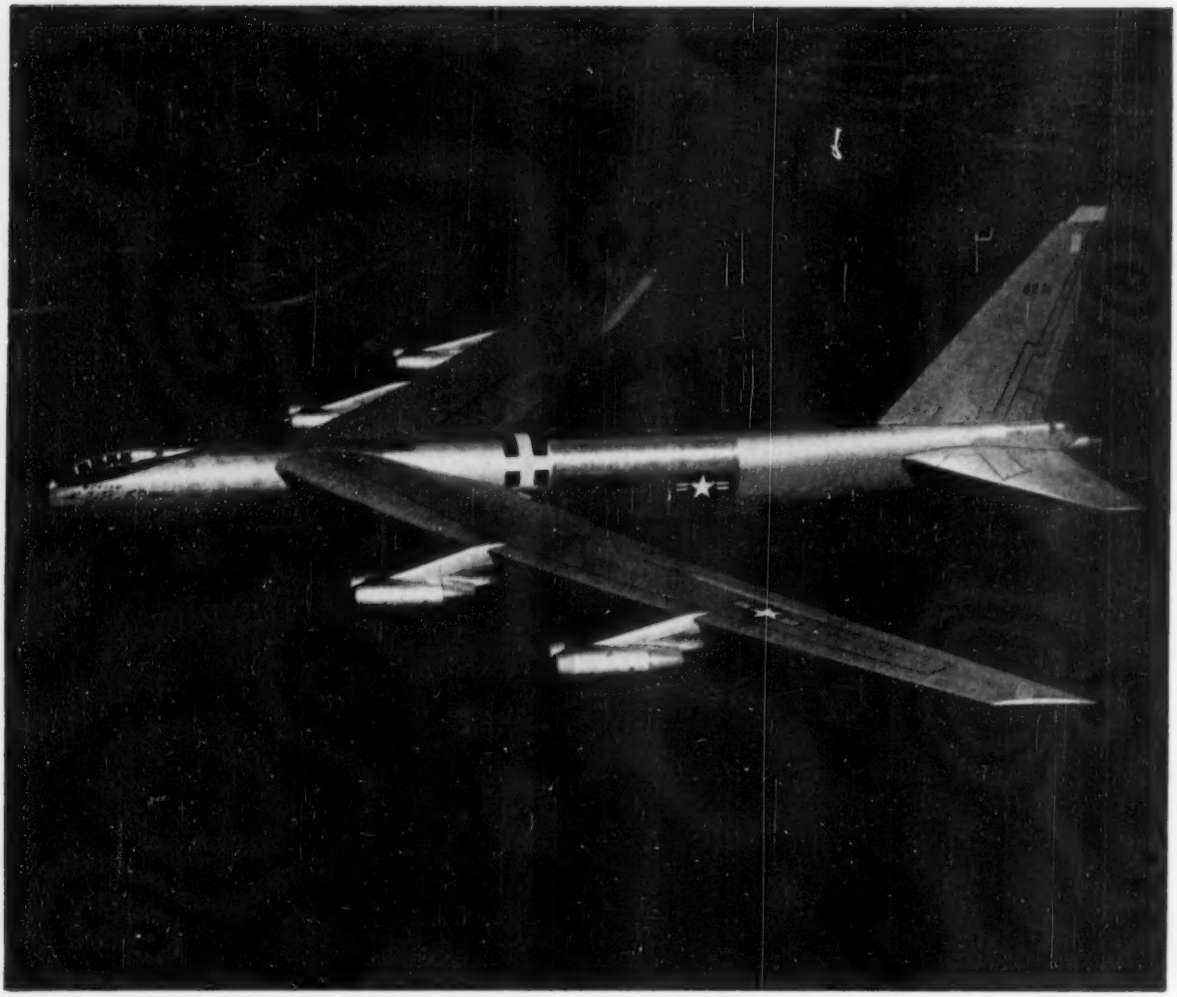
• With gear down, flaps up, power on, needle centered at 93 mph. indicated airspeed (this was used as checkpoint).

• With gear and flaps up, power off, the needle centered at 110 mph. IAS.

• With gear and flaps up, approach power (18-20 in. Hg manifold pressure), steep 45-deg. bank, the needle centered at 118 mph. IAS.

▶ **What It Is**—The Landing Speed Indicator system is made up of these components:

• **Wing lift transducer.** This pickup is actuated by a small vane located under the leading edge of the wing. Spanwise position of the vane is not critical. Chordwise, it should be located within 1½% to 14% chord. The vane is affected by both airspeed and angle of attack. It combines the required air-



America's new double-edged weapon

The huge Boeing B-52 Stratofortress is the newest weapon being built for America's air arsenal. It is, in a sense, a double-edged weapon. Respect for its retaliatory striking force is a deterrent against aggression. And it is a weapon of offense that, if need arose, would add great strength to our strategic air arm.

This giant new Boeing is engineered to strike at sources of war power deep behind hostile frontiers. To accomplish this the Stratofortress is designed to carry heavy loads over vast distances—at high speed and extreme altitude. Such performance is necessary to counteract the efforts a potential enemy would make to protect vital targets.

Powered by eight powerful jet engines, the B-52 measures 185 feet from wing tip to wing tip, and its gross weight is more than 150 tons. Its speed and ceiling, though not revealed, are unique for an aircraft in the heavy bomber class.

Boeing is actively in production on the B-52. This air giant, and the six-jet B-47 medium bomber, have given Boeing more experience with multi-jet aircraft than any other company. This background, together with Boeing's 36-year history of sound engineering and production integrity, gives assurance that the B-52 will inherit the tradition of rugged dependability established by Boeing's Flying Fortresses and Superforts of the last war.

For the Air Force, Boeing is building the
B-47 Stratojet, C-97 Stratofreighter and the B-52 Stratofortress;
and for the world's leading airlines, Boeing has built fleets of twin-deck Stratocruisers

BOEING

speed and angle of attack to give optimum lift coefficient reading. In its position under the wing leading edge, the vane senses changing airflow as wing splits airstream to pass over or under airfoil. This point where air is split—called the stagnation point—has a direct bearing on wing's lift coefficient.

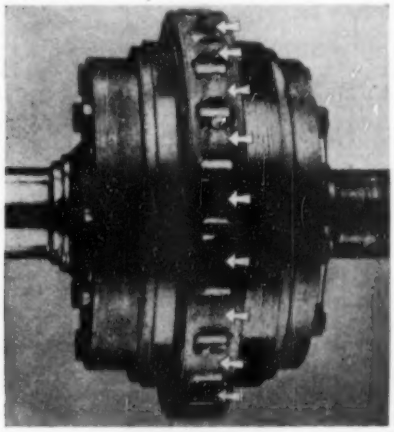
The transducer unit contains a sealed, frictionless variable-reluctance transformer which gives continual measurement of wing lift coefficient during approach and takeoff.

• **Adapter control box.** This unit, located between the transducer and the LSI, contains two adjustments. One is the null point which allows you to adjust the needle to indicate any desired percentage of lift at a particular point on the dial of the LSI. Second adjustment regulates airspeed spread of the arc. Maximum reading is about 40 mph. with a 10-mph. override at each end. The whole white band can be made to represent only one knot if desired.

• **LSI.** The Landing Speed Indicator is the instrument from which the pilot gets his information.

The present system was developed from Safe Flight's widely known stall warning indicator. Big differences are that the latter indicated only one point in an aircraft's airspeed, while the former gives continuous information over a range of airspeeds. In the stall warning indicator, the vane closes a switch actuating a warning device in cockpit.

According to Safe Flight officials, several firm orders have been received for the LSI system. Pilot production was completed last week and production quantities should be available soon.



HEAT DID THIS

This is what can happen to modern jet engine main rotor bearings when lubricant becomes overheated. Photo shows buildup of coke-like deposits (arrows) on Wright Aero Corp. test rig. A principal cause for the overheat condition is heat soak-back after engine has been shut down, according to Standard Oil Development Co.

VHF Omnirange Systems (VOR)
Terminal VHF Omnirange Systems (TVOR)
Instrument Landing Systems (ILS)
Fan Markers
Marker Beacons

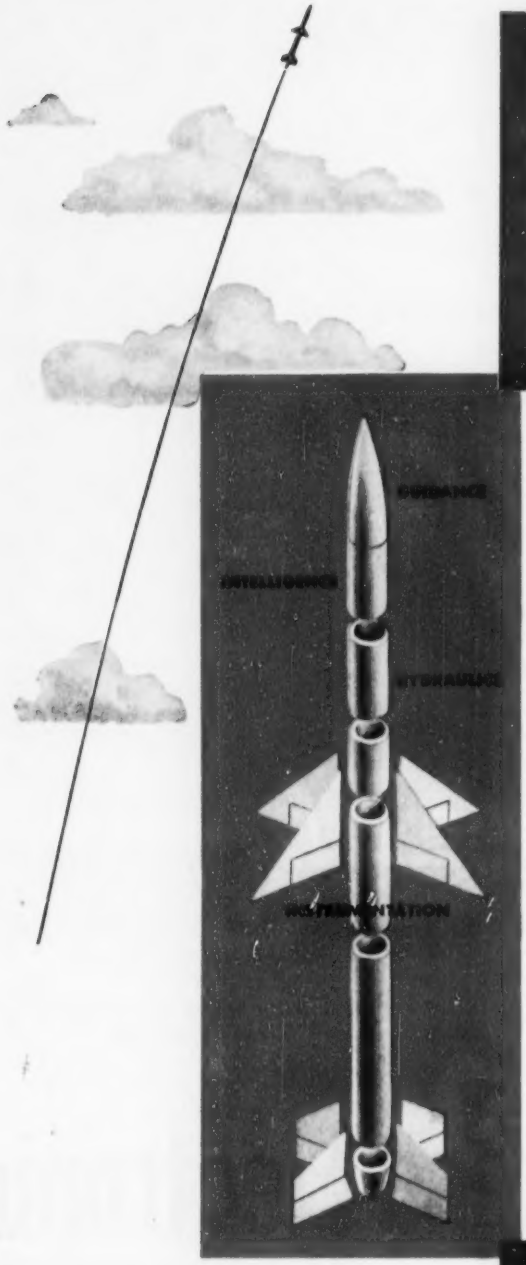
All these are available as single or dual units. We manufacture a complete line of ground navigational aids. Write for literature.

Maryland Electronic

MANUFACTURING CORPORATION

College Park, Maryland

FOR EVERY GUIDED MISSILE



BENDIX-PACIFIC
CAN SUPPLY
ELECTRONIC and HYDRAULIC PACKAGE ASSEMBLIES

Complete familiarity with missile programs coupled with modern engineering and manufacturing facilities enables Bendix-Pacific to offer the most advanced unitized assemblies in either standard or subminiature construction for any missile program.

Bendix-Pacific is now producing:

- intelligence packages
- guidance packages
- instrumentation packages
- packaged hydraulic systems.

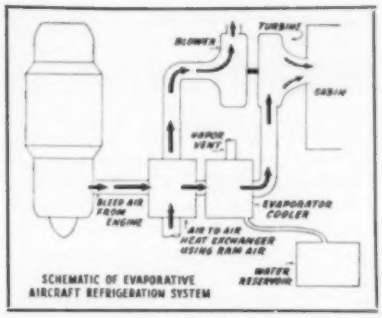
Which do you need to modernize your missiles?

Write or wire for complete information

Bendix
Pacific Division
NORTH HOLLYWOOD, CALIF.

East Coast Office: 475 Fifth Ave., New York 17 • Export Division: Bendix International, 72 Fifth Ave., New York 11 • Canadian Distrib.: Aviation Electric, Ltd., Montreal

AIRCRAFT HYDRAULIC CONTROLS • AIRBORNE RADAR • SONAR • INDUSTRIAL HYDRAULIC CONTROLS • TELEMETERING • ELECTRO-MECHANICAL EQUIPMENT



SCHEMATIC OF EVAPORATIVE AIRCRAFT REFRIGERATION SYSTEM

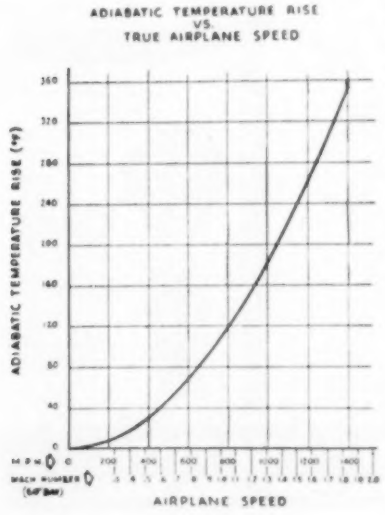
Powerful Cooler for Supersonic Jets

The tremendous cooling needs of supersonic experimental aircraft such as the Douglas X-3 may be served by evaporative refrigeration units like the one shown in the schematic diagram above. Model number of the unit and its maker's name are restricted.

The graph printed below illustrates the speed/temperature relationships that promise to give cooling engineers their big headaches. For instance, at Mach 1 (760 mph. at sea level under standard conditions), ram air rise is about 100F. This goes to 240F at Mach 1.5, and tops 360F at Mach 2. Plane skin can be made of titanium to resist the high temperatures. But the pilot's body is something else again.

The unit is also used to cool wheel wells. Life and strength of tires would probably be cut considerably if subjected to elevated temperatures.

Addition of the evaporative cooler between the air-to-air heat exchanger and the expansion cooling turbine is what gives the illustrated unit its high capacity. Water is fed to it continuously and the vapor is dumped overboard. The mighty, little package absorbs over 2,500 hp. from the plane's engines under full output conditions.



INTERCONTINENTAL

an insight into why.....

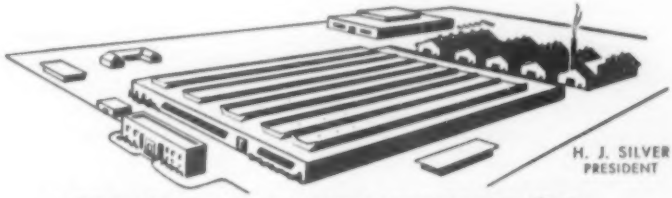
Our accuracy in tooling and engineering has enabled us to produce aircraft parts to rigid Government specifications in record time.

The high quality of Intercontinental's jigs, dies, tools and fixtures combined with aircraft experience insure low cost production and fast delivery for all of our products.

Further evidence of our proven ability is the fact that Intercontinental is one of the select few who has been approved for AUTOMATIC SOURCE INSPECTION.

Write... Today!

Our engineering and production departments CAN solve your problems



H. J. SILVER
PRESIDENT

INTERCONTINENTAL
MANUFACTURING COMPANY, INC.
GARLAND, TEXAS

the
ACCURACY
and
SPEED!
of

LAPOINTE
BROACHING

is achieving
production
miracles for
manufacturers
of

jet
engines

Literature is available describing Lapointe Broaching Machines, Tools, and Fixtures — and telling what they will accomplish in your plant to *speed production and reduce costs.*

Ask for Bulletin AW-16

LAPOINTE
MACHINE TOOL COMPANY
HUDSON · MASS · U. S. A.
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

Analyzers Cut BCPA Sparkplug Troubles

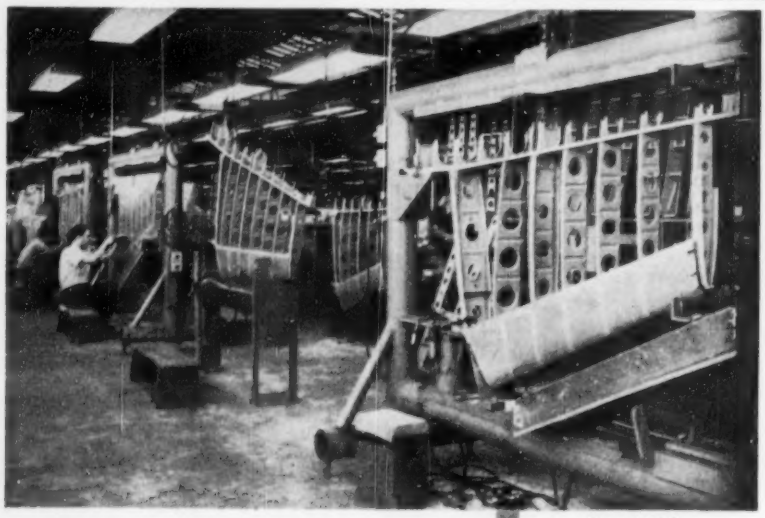
British Commonwealth Pacific Airlines has obtained dramatic benefits from the installation of Scintilla airborne ignition analyzers in its fleet of four Douglas DC-6s, Bendix-Scintilla reveals. The planes are powered by Pratt & Whitney Aircraft R2800-CA15 engines, equipped with Scintilla high tension ignition systems.

Comparing an eight-month operation period without analyzers and a three-month period with (December 1952 through February 1953), BCPA got:

- **Reduction in number** of sparkplugs used–24%.
- **Increase in plug life**–from 146 to 190 hours.
- **Drop in delays** due to ignition malfunctions–80%.
- **Reduction of time delays** due to ignition troubles–94%.
- **Dollar savings** on sparkplugs and installation and removal labor–$3,100 (Australian labor rates) per year.

Intangible advantages attributable to analyzer use include increased on-time performance and passenger good-will because of fewer delays.

BCPA personnel instructed themselves in the use of the analyzer.



Above F-84 fins and rudders by EDO

Edo means more than
PRECISION WORKMANSHIP

EDO Means *Design*, Too. Water plays no favors. Water leaks through any structure not precisely built. That's why making seaplane floats for 27 years has made precision manufacture of aluminum components a specialty at EDO.

Because of this unusual metal-working know-how, many manufacturers are turning their hard-to-make parts and sub-assembly problems over to EDO.

What's more, EDO's vast engineering staff, which has designed everything from complete aircraft to the Navy's latest sonar equipment can tackle problems right from the design stage, if desired.

Perhaps EDO can help you.

A FEW EXAMPLES OF EDO CRAFTSMANSHIP

Famous EDO Seaplane Floats

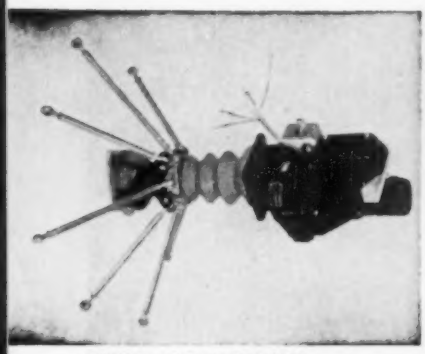
USAF A-3 airborne lifeboat

Precision Radar Reflector

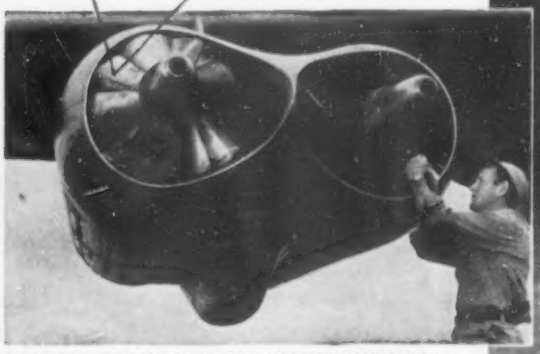
Electronic Cabinet

Edo CORPORATION
Since 1925
COLLEGE POINT, NEW YORK

To assure instant operation of jet assist engine air intake doors under icing conditions



COURTESY LEAR INCORPORATED



COURTESY CONSOLIDATED VULTEE AIRCRAFT CORPORATION

SILASTIC works

where other materials fail!

Auxiliary jet engines are fitted with aluminum air intake doors which close to reduce drag when not in use, and open when the engines are summoned for extra bursts of power at take off or in flight.

These doors must always respond to the pilot's instant command on the ground, at sub-zero altitudes or under icing conditions.

This requirement was met by embedding heating elements in a piece of Silastic sandwiched between two sheets of aluminum that are shaped to form the door segments. The Silastic insulates the heating element; withstands surface temperatures up to 450°F, and conducts heat rapidly to the aluminum intake doors.

These doors are opened and closed by means of an actuator and screw jack assembly. To prevent dirt and ice from fouling the screw jack, exposed sections are encased in a heat resistant Silastic bellows that retains its flexibility at temperatures down to —100°F.

In designing this anti-icing assembly, Silastic proved to be the only material that remained resilient and serviceable after continuous vibration and repeated exposure to temperatures ranging from —100°F to +450°F.

Such performance is typical of Silastic, the Dow Corning silicone rubber. When you need a material that will remain rubbery and retain its excellent dielectric properties after long exposure to temperatures from below —70° to above 500°F, or after prolonged weathering or contact with a variety of hot oils and chemicals, ***specify Silastic.***

*T. M. REG. U. S. PAT. OFF.

Get the facts about Silastic from your fabricator or write direct

first in silicones

DOW CORNING CORPORATION

MIDLAND, MICH.

Atlanta Chicago Cleveland Dallas New York Los Angeles Washington, D. C.
In Canada: Fiberglas Canada Ltd., Toronto England: Midland Silicones Ltd., London

mail coupon today

DOW CORNING CORPORATION, Dept. D-5A, Midland, Mich.

Please send me:

☐ List of Silastic Fabricators ☐ Silastic Facts 10a ☐ "What's A Silicone?"

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

HUMPHREY LINEAR POTENTIOMETER

ABSOLUTE PRECISION LINEARITY

Gives noise-free, sharp out-put when subjected to vibration, dither and other environmental conditions. Rugged, lightweight, with exclusive internal design.

Resistance Values to 13,000 ohms/inch, higher in special units.

½" diam. for strokes up to 3"

¾" diam. for strokes over 3"

SPECIAL CONSTRUCTION AVAILABLE FOR HIGH TEMPERATURE APPLICATIONS

NEW HUMPHREY ACCELEROMETER

Readily adapted to wide selection of g ranges.

Accuracy: From plus or minus 1% at zero, to plus or minus 2% at maximum acceleration.

A RUGGED, COMPACT ACCELEROMETER with integral Potentiometer take-off, giving amazing accuracy under adverse conditions, due to the rugged construction. No "cross-talk".

FULLY TESTED AND QUALIFIED FOR MILITARY APPLICATIONS

Write Our Nearest Office, Dept. AW18

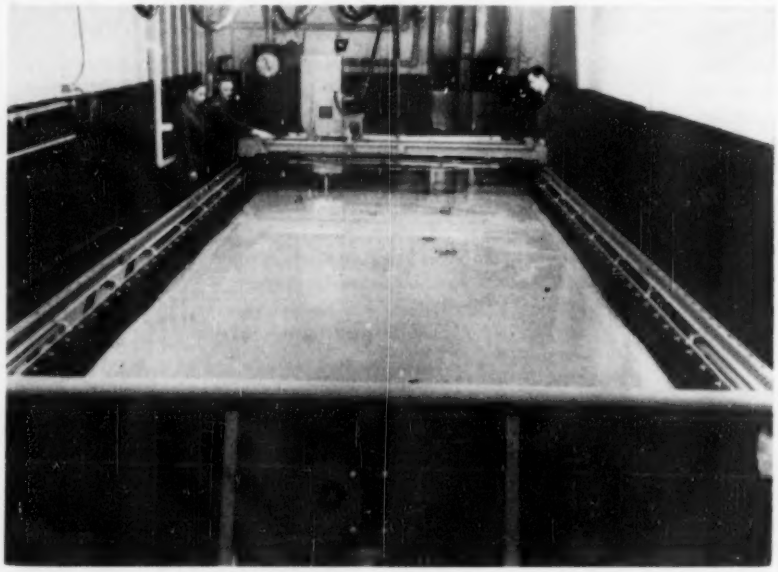
Pacific SCIENTIFIC CO.

1430 Grande Vista Ave., Los Angeles 23, Calif.
25 Stillman Street, San Francisco 7, California
1915 1st Avenue, South, Seattle 4, Washington

AVIONICS

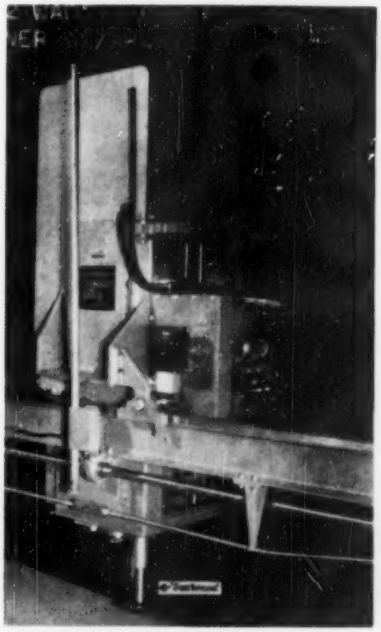
Simulator to Train Bomber Crews

1 Air Force bomber crews will get advanced radar navigation and bombing training on new AN/APQ-T1 ground simulator designed and built for Air Research and Development Command by American Machine and Foundry Co.'s Electronics Div. at Boston. Simulator bounces ultrasonic pulses off . . .



2 Miniature map submerged in large tank of water. Map is scaled down by 200,000-to-1, the ratio of radar wave's velocity in air to sound wave's velocity in water. Returning echoes are presented on trainee's radar scope.

3 Instructor's console and bombsight inputs introduced by the trainee control the traveling crane (Figure 4). Instructor simulates winds, enemy jamming, or ground radar beacons.



4 Ultrasonic pulses are generated and echoes are picked up by "sontenna" on bottom of traveling crane which moves over water-covered map, simulating airplane motion over terrain.

5 Two plotting boards record the simulated airplane course to target area, flight path during bomb run, point of bomb release and point of bomb impact for scoring of students.

TECO ...

the airline seat with

THINK

THINK

THINK

Exploring all lines of thought in every direction has resulted in TECO leadership for the development of improved design, stronger lightweight construction, trouble-free operation plus greater safety and economies in modern airline seats. These are outstanding reasons why leading airlines agree the finest airline seats are TECO-built! Catalog sent on request.

manufactured by

TRANSPORT EQUIPMENT CO.

Burbank • California

REPRESENTED IN CANADA BY:
RAILWAY & POWER ENGINEERING CORPORATION
LIMITED • 3745 St. James Street • Montreal 30, P. Q.

Giant Forging Press Expands Design Concepts

With Alcoa's new 15,000-ton forging press, far larger and more intricate forgings can now be produced. Complete airframe subassemblies forged in a single unit open entire new design concepts . . . eliminate time-consuming assembly of parts . . . put stronger muscles in tomorrow's aircraft.

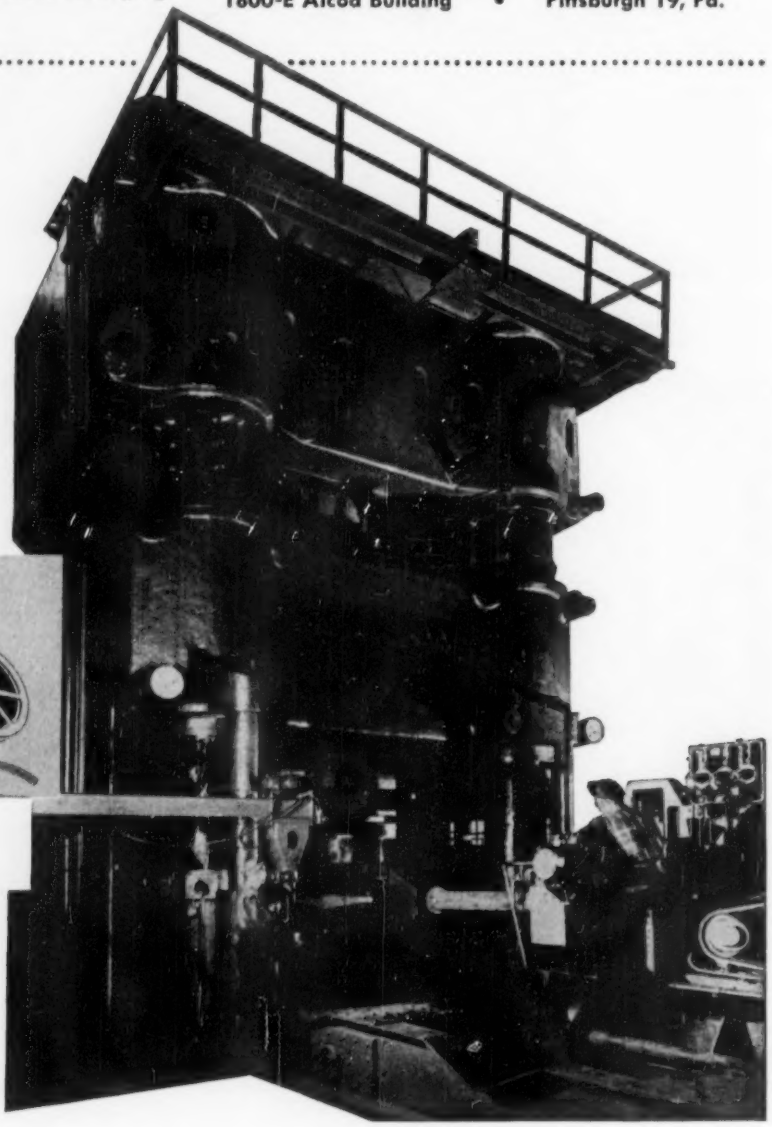
Today, Alcoa furnishes McDonnell Aircraft Corporation with 350-pound, carry-through forgings for their "Demon" jet fighter. Two of these forgings, when machined and finished, replace a series of extrusions and sheet metal build-ups. This results in a saving not only in weight and man-hours, but also in the cost of expensive jigs and fixtures.

Recent years have shown a tremendous increase in the number of applications using aluminum forgings. This is due, partly, to new and better alloys developed by Alcoa; to increases in forging size and complexity; and to the inherent advantages of aluminum, itself . . . strength, smoothness and corrosion resistance.

Want to know more about these Alcoa facilities? How they can help speed-up your company's production lines? Your local Alcoa sales office has all the information and will be glad to discuss your own particular problems. The number is in the telephone directory—listed under "Aluminum."

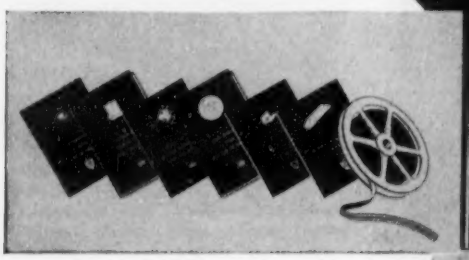
Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA
1800-E Alcoa Building • Pittsburgh 19, Pa.



Aircraft and Parts Manufacturers

Free Alcoa "How-To-Do-It" Books—plus the use of sound movies—are available to help you train your employees. Ask for any of these books: *Forming Alcoa Aluminum, Machining Alcoa Aluminum and Its Alloys, Welding and Brazing Alcoa Aluminum, Riveting Alcoa Aluminum, Designing for Alcoa Forgings, Alcoa Aluminum and Its Alloys.* Sound films are available on most fabrication processes.



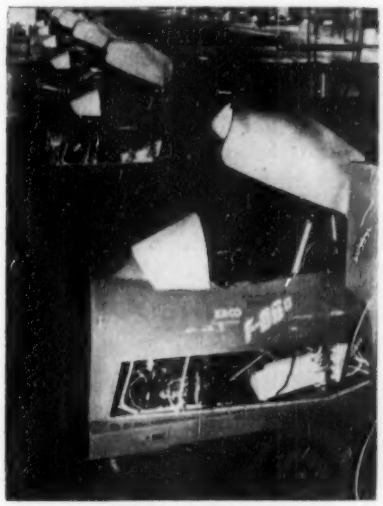
"SEE IT NOW" with Edward R. Murrow —CBS-TV every Sunday . . . brings the world to your armchair. Consult your newspaper for local time and channel.

FILTER CENTER

▶**E-11 Autopilot for CF-100, F-101**—Minneapolis-Honeywell's new E-11 autopilot, already slated for use on the Douglas RB-66, has now been scheduled for the Avro CF-100 and the McDonnell F-101. CF-100 was originally scheduled to use only an M-H yaw damper.

▶**Westinghouse Tail Turret**—Westinghouse Electric Corp. is building a radar-controlled tail turret for the Navy's new Douglas A3D carrier-based medium bomber. This is the company's first entry into the bomber armament field although it has previously built interceptor fire control systems, one of which is in use on Douglas F3Ds in Korea (AVIATION WEEK Feb. 9, p. 13).

▶**Boeing Seeks Explosion Protection**—Boeing is reportedly asking avionic equipment suppliers to make all equipment "explosion resistant" following the recent loss of a B-47 in a fire while on the ramp at Wichita. (An explosion-resistant device retains any internal explosion within the unit.) New JP-4 jet fuel is said to be much more volatile than its predecessor. —PK

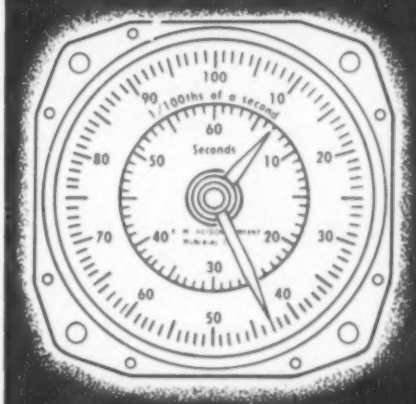


SABRE SIMULATOR

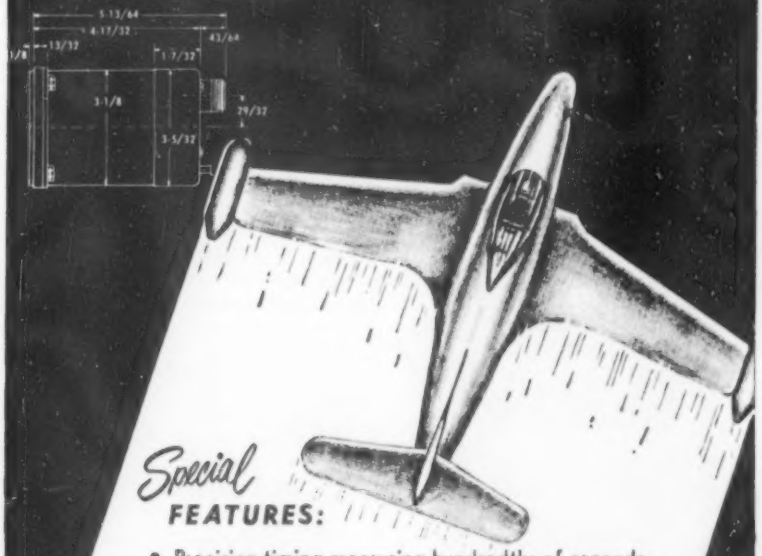
Flight simulator for the North American Aviation F-86D all-weather interceptor is the first to reproduce an entire operational problem, including radar interceptions, according to Engineering and Research Corp., which makes the simulators for the Air Force. The Erco simulator requires two instructors, one for regular flight and radio aids, the other to monitor the pilot's radar interception techniques. Simulator consists of 16 equipment racks, an air conditioned instructor's room, and the cockpit shown. It uses over 1,200 vacuum tubes.

NEW A. W. HAYDON COMPANY

STOP CLOCK



High Speed Stop Clock Accrued Seconds Indicator With Fluorescent Dial and Hands . . . Also Available For Other Intervals.



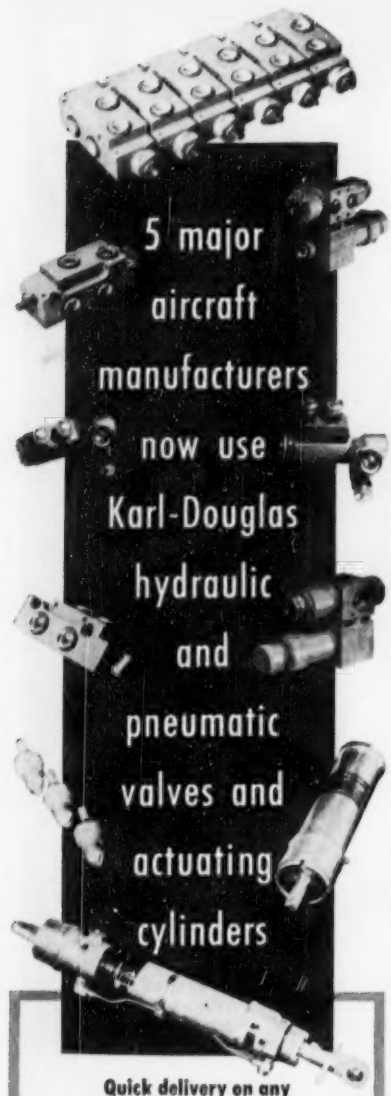
Special FEATURES:

- Precision timing measuring hundredths of seconds to one minute.
- Automatic reset.
- Hermetically sealed.
- For operation on 50, 60, or 400 cycles A.C. or 20-30V D.C. 400 cycle unit has D.C. clutch.

This new, hermetically-sealed *Stop Clock* further enlarges the complete line of A. W. HAYDON COMPANY A.C. and D.C. Timers, time delay relays and timing motors. This accurate, panel-mounted timer totalizes hundredths of a second up to a minute. Hermetically-sealed, it weighs approximately 2 lbs. Comes with automatic reset.

WRITE FOR CATALOG

The A. W. HAYDON COMPANY
222 NORTH ELM STREET
WATERBURY 20, CONNECTICUT
Design and Manufacture of Electrical Timing Devices



Quick delivery on any type, size or quantity!

K-D hydraulic and pneumatic valves and actuating cylinders are built to manufacturer's specifications or to original designs developed by K-D's experienced hydraulic engineers.

All parts are precision machined and carefully inspected before shipment. Facilities are available for large scale production.

For further information please write to:

Karl-Douglas Associates

3160 WEST EL SEGUNDO BLVD.
HAWTHORNE, CALIFORNIA

FINANCIAL

What Airmail Decision Can Mean

Appeals Court ruling may affect all carriers which derive part of their income from mail subsidies.

The recent decision of the Federal Court of Appeals directing the Civil Aeronautics Board to consider all income of an airline in determining airmail rates is likely to have far-reaching implications throughout the air transport industry (AVIATION WEEK May 18, p. 83).

The Post Office Department initiated the string of events leading to the present circumstances by protesting the failure of CAB to offset a carrier's subsidized mail rate with income derived from all other sources.

▶ **Two Decisions**—The court upheld the Post Office position in two separate rulings.

In the first, a two-to-one decision, the court found that in establishing a mail rate for Chicago & Southern Air Lines' International Div., CAB should have offset such mail compensation from alleged excessive earnings derived from that carrier's domestic operations.

In the second decision, this time unanimous, the court held that in fixing a subsidy mail rate for Western Air Lines, the Board should have taken into account the profits derived by that airline when it sold a route and equipment to United Air Lines.

The Post Office has long been irked at being forced to make airmail payments as established by the CAB and over which it has had no control.

For all practical purposes the current Court of Appeals rulings will now become effective in their application against Chicago & Southern (since merged with Delta) and Western Air Lines.

CAB has indicated it will appeal these decisions to the Supreme Court. However, by the time all procedural steps have run their course, at least a year may have elapsed. And then, of course, there is no assurance that the Supreme Court will reverse the Court of Appeals.

Accordingly, attempts may soon be placed in motion to recapture alleged mail overpayments made to Chicago & Southern and Western. Perhaps of even greater import are the possible consequences to other carriers now receiving subsidy mail payments.

▶ **The Effects**—The Chicago & Southern determination covers the period from 1948 to 1950 and involves an alleged overpayment of $645,000. In July 1948 CAB fixed mail subsidy rates for the company's domestic routes estimated to yield a net return of 7.4%, after taxes, on the carrier's investment. Actually, the average yield for 1948 through 1950 was 12.5%. The court has now ordered that the Board should have offset this $645,000 profit in domestic operations when it determined the mail payments for the carrier's Latin American routes. Any recapture effected here will be borne by Delta as the successor airline.

In the same manner, Western is subject to a substantial recapture of mail revenues. This is a product of the sale of its route between Los Angeles and Denver, plus certain equipment to United for $3,750,000 in 1947. Of this, $722,000 was computed as profit on the sale of the equipment and was included in the Board's calculations for mail pay. The other $477,000 in profit for "intangibles," such as the certificate and the route, was not included in the Board's calculations for mail pay for operations in the period from 1944 to 1948.

▶ **"Open" Rate**—In addition, but yet to be ascertained, is the status of other carriers where any degree of mail pay subsidy may prevail in an "open" rate period. In this respect, carriers subject to scrutiny would include:

- **System operations** where both subsidized and unsubsidized mail rate conditions exist. This would include such carriers as Braniff, Northwest, and TWA who are now declared to have a service rate for domestic operations but not for their international divisions.
- **All other subsidized carriers** who may have derived "other income" through various means separate from normal operations.
- **An international airline,** such as Pan American World Airways with separate divisions, all with varying degrees of profitability (and even losses) commanding differing mail pay rates. In other words, the offset principle may find ready application in viewing the company's over-all operations.
- **Other primarily domestic carriers** who have international or overseas operations now on a completely service rate but who had hoped to obtain higher mail payments for the latter type of activity. These may now find it difficult to do so. This category includes

United, National and Eastern, who have protested the treatment of their non-domestic routes as "stub-end" operations of their systems and thus regarded as entitled only to the nonsubsidy domestic service rate.

▶ **Basic Factors**—Key elements in all of these determinations revolve around two basic factors. First, an "open" rate period must exist for a subsidized operator to be subject to this recapture through offset from other sources. Second, and more difficult to establish, is the relative degree of profitability that may exist for the carriers involved.

Presumably if a carrier earned less than the so-called statutory rate of return on the investment, be it 6 or 8%, it might not be subject to any offset or recapture. The carriers and CAB, however, rarely are in accord as to the allowable investment "used and useful" for division or system operations.

▶ **Crazy-Quilt Rates**—It is obvious that the consequences now set in motion by the Court of Appeals findings serve to compound the existing crazy-quilt pattern of rate-making evolved by the CAB.

In seeking to justify its subsidy support for C&S, the Board previously asserted it did so because of "the public interest in maintaining and furthering the incentive to carriers." "Incentive" also figures prominently as a basis of approving the Western route sale to United.

Yet in viewing "all other revenue" in separate rate proceedings, CAB has developed a long string of contradictory and conflicting opinions. For example, in some instances, profits from the sale of property were ignored in fixing subsidy mail rates. In other cases similar increments from non-operating sources which were equally important in generating "incentives," were applied to offset the need for higher mail pay. Consistency in policy is decidedly absent.

Each decision appears to serve the exigencies of the moment with little regard by the Board to any long-range consequences.

The current Circuit Court of Appeals rulings, in addition to reflecting on the past inconsistencies of CAB rate-making "principles," is another poignant reminder that uneasy is the position of any carrier subject to subsidy mail rate determinations as presently conceived.

—Selig Altschul

Lockheed Earnings Rise

Lockheed Aircraft Corp., Burbank, Calif., estimates first-quarter earnings this year at $3.5 million, sales at $158.5 million, compared to earnings for the same period last year of $1,057,700 and sales of $89,980,000. Backlog at the end of March was $1,576,485,000.

FOR LIGHT GAUGE WELDING

Use miller

SELENIUM RECTIFIER TYPE D. C. ARC WELDERS

MILLER SR Welders are the greatest advancement in arc welding in the past 25 years . . . it is an undisputed fact that MILLER SR Welders will lay down a higher quality bead of weld metal than any other D.C. welder known today . . . the welding range of the MILLER SR-100 enables you to do superior welding on light gauge metals—by metallic arc, inert gas or consummable electrode. Four other larger sizes available for heavier welding applications.

The magnetic amplifier principle built into the MILLER SR Welders provides welding flexibility not available from any other D.C. power source.

Write today for the complete story, and the name of your nearest MILLER distributor.

WELDING RANGE 2½ TO 135 AMPERES

MODEL SR-100

ARC-SPOT miller WELDERS

miller ELECTRIC MANUFACTURING CO.
SINCE 1929 • APPLETON • WISCONSIN

CPI PLUGSTAT

Factory-set and Sealed Calibration

Miniature thermal overheat warning switch used extensively as an overheat indicator on helicopter and other gear box assemblies, aircraft generators or wherever temperature warning is desired. Extremely rugged construction and sealed against moisture and dirt. Supplied with wire. Aircraft type for AN connector available. Ask for illustrated catalog.

CONTROL PRODUCTS INC.
306 SUSSEX ST., HARRISON, NEW JERSEY
DESIGNERS AND MANUFACTURERS OF THERMAL DEVICES

Napoleon said, "An army marches on its stomach."

AN AIRCRAFT FLIES ON ITS COMPONENTS

Even the bush-pilot uses radio. Radio uses electronic components. MILO sells them: the originals for experimentation and production, the proper replacements—needed in ones and twos or by the hundred. For Radios, Intercoms, PAs, Marker Beacon Receivers, Localizers, Glide Path Receivers, Automatic Pilot and Automatic Direction Finders, Fuel-Gage and other Amplifiers. Leading Brands in Stock.

MILO has the components YOU must have to make or maintain electronic flight aids.

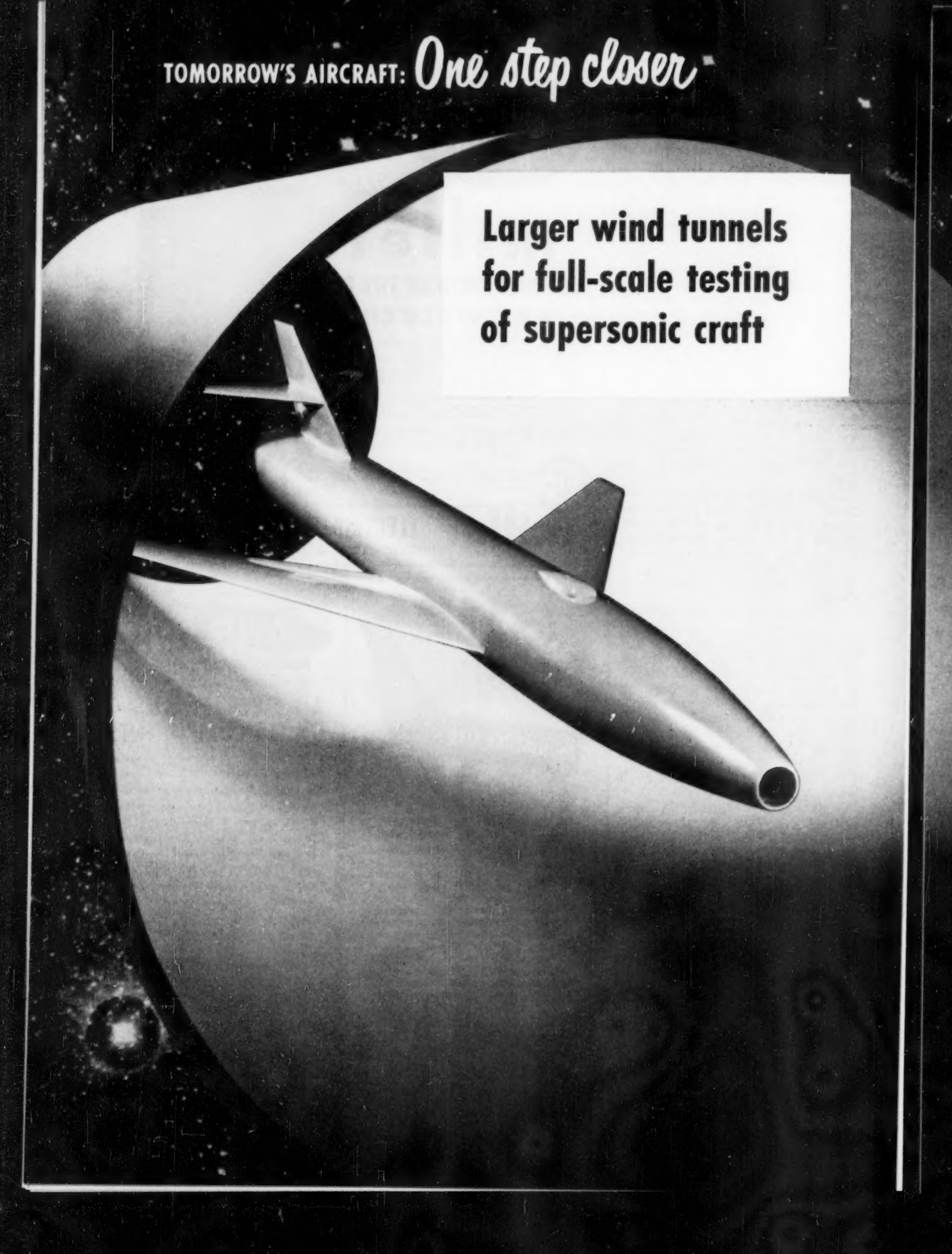
Ruggedized Tubes
GE, RCA, Others

RELAYS, SWITCHES, CONNECTORS AND—the LINK between LIFE and DEATH—LITTELFUSE Aircraft Fuses

Write for FREE Catalogs

MILO RADIO & ELECTRONICS CORP
ELECTRONICS FOR INDUSTRY
200 Greenwich St., New York 7, N. Y.
BEekman 3-2980

TOMORROW'S AIRCRAFT: *One step closer*



Larger wind tunnels for full-scale testing of supersonic craft

The largest rotating system in the world is now being built by Westinghouse for installation in the United States Air Force, Arnold Engineering Development Center's Propulsion Wind Tunnel at Tullahoma, Tennessee. This giant wind tunnel will accelerate the full-scale testing of turbo- and ram-jet aircraft engines as well as components of planes and missiles, in the 2000-mph range . . . well into the supersonic speeds of tomorrow's air age.

Westinghouse applied a new concept in wind tunnel engineering by designing a single axial flow compressor to feed both the transonic and supersonic tunnels from a single drive shaft. Most powerful of its kind ever built, it uses four motors in tandem—delivering over 200,000 hp to drive five giant compressors whose full output is translated into wind speed. This single-unit system is an imposing spectacle of man-made machinery, barely suggested by its over-all length of 575 feet and 7000 tons of weight!

Thus, Westinghouse creative engineering and productive skill are assisting the U. S. Air Force in providing a facility which will simulate flight under a wide range of transonic and supersonic conditions, greatly expanding the horizons of aircraft and missile development. And the experience and ability devoted to such an installation demonstrate once again the unique capabilities in the wind tunnel field . . . all paving the way for new research beyond today's barriers, basic to continued military and commercial air leadership. Proving, above all else, that you should look to Westinghouse when you have a problem in aviation. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-91008

Above is an artist's sketch of Propulsion Wind Tunnel in which Westinghouse's 200,000-hp driven compressors will create supersonic speeds. Compressor blades are over two feet across the face, six feet long, weigh some 3500 pounds and have a tip speed of 650 mph with a centrifugal force of 800 tons constantly pulling at their roots! At the right is a stator for one of the two massive 83,000-hp synchronous motors which are over 21 feet high, weigh 225 tons and are at least one third larger than any other synchronous unit ever built.

THE SCOPE OF WESTINGHOUSE IN AVIATION

Basic aircraft systems

Turbojet Engines, Fire Control, Radar, Autopilots, Communication Equipment and Electrical Systems.

Ground equipment

Wind Tunnels, Airport Lighting, Industrial Plant Apparatus.

Air-borne system components

Transformers, Rectifiers, Instruments, Gyro-motors, Temperature Control Panels, Generating Equipment and System Control, Circuit Breakers, Contactors, Motors, Actuators and Hoists, Electronic Tubes, Magamps, Micarta®.

YOU CAN BE SURE... IF IT'S

Westinghouse

ROBBINS

AERONAUTICAL EQUIPMENT

INSTALLATION ENGINEERS

LIQUID OXYGEN DEWAR BOTTLES

AIRBORNE & GROUND EQUIPMENT

ROBBINS

DEHYDRATION HI-LO PRESSURE

AIRBORNE & GROUND EQUIPMENT

ROBBINS

CONTROL COMPONENTS

PUSH-PULL TUBES

ROBBINS

AIRCRAFT MODIFICATION

& OVERHAUL

National Representatives

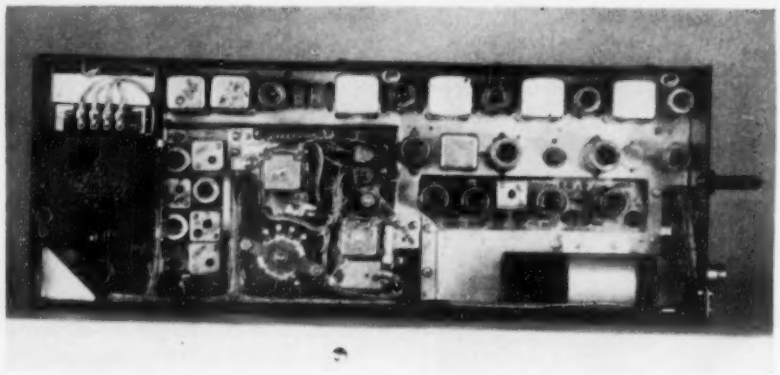
ROBBINS and Associates

1735 W. FLORENCE AVE.
LOS ANGELES 47, CALIF.

826 KNOTT BLDG.
DAYTON 2, OHIO

TIME FLIES • SO DO WE

NEW AVIATION PRODUCTS



Bendix Receiver Has 360 Channels

Recent development of a 360-channel airline receiver (RA-18B) by Bendix Radio Division reflects the growing demands on radio and the crowding on the VHF spectrum. The set is designed for air-to-ground communications (118 to 135.9 mc.).

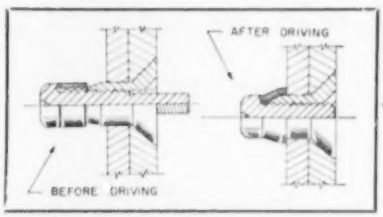
Spacing between channels is 50 kc., instead of 100 kc. which has been normal practice. However, interference from adjoining reception frequencies and other causes is kept to 75 decibels below that of the frequency selected, well within allowable limits, in Bendix's opinion. The receiver is designed to "surpass the most exacting requirements demanded for operation in highly congested areas," Bendix says.

The company also considers the set ideal for double-channel duplex operation; that is, for continuous operation in the presence of a transmitter that is also operating, even when the transmitter-receiver frequency separation is only 5½ mc. Previous sets could not work this close to an airborne transmitter and still meet airline requirements, Bendix claims. This feature also anticipates possible tighter ground control in the future when the plane in flight may have to receive instructions or code signals of some type continuously.

The receiver weighs 17.25 lb. without power supply, 21.3 lb. with 27.5-v. d.c. power provisions, or 20.06 lb. with 115-v. a.c. (300-1,000-c.) power. It has 15 ruggedized tubes and one voltage regulator tube. Sensitivity of the set is 2.5 microvolts on all channels; squelch is adjustable to open from receiver noise threshold up to 25 microvolts; automatic gain control holds output within 3 decibels down from 5 to 100,000 microvolts; audio output is more than 200 milliwatts.

The set is a companion piece for the TA-18B transmitter, made by the same firm. The two together furnish complete VHF communications and allow control from a single panel, Bendix says. The panel is calibrated directly in frequency and is illuminated by the Bendix Da-Nite system. This provides white lighted numerals by day, and red at night.

The receiver is mounted in a standard JAN-A1-D form factor housing and is fitted with removable side covers. Bendix Radio Division, Bendix Aviation Corp., Baltimore 4, Md.



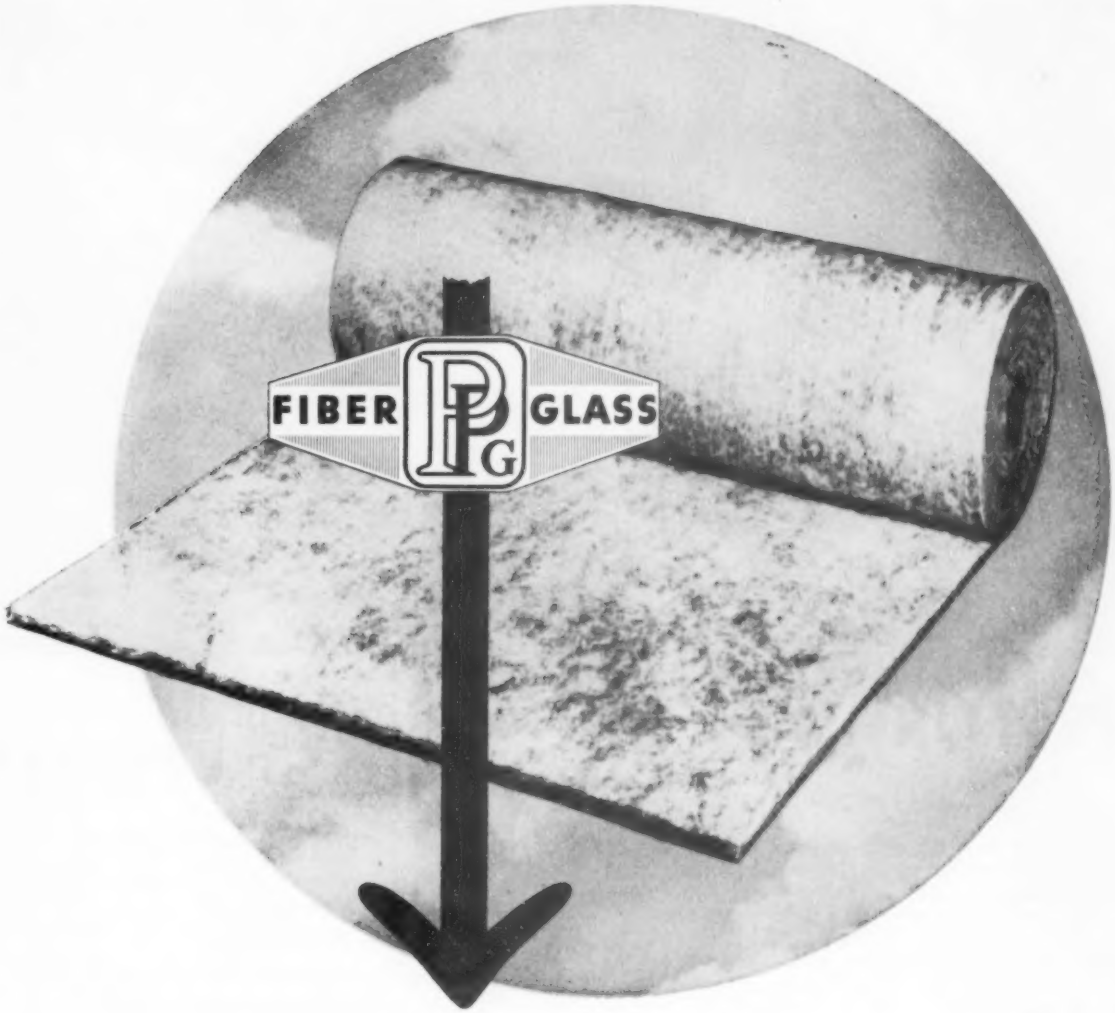
Blind Locking Bolt

Lok-Fast Inc.'s new blind bolt for flush mounting in aircraft assemblies is lighter in weight than any other screw or bolt of equal diameter and grip, the company says.

With its blind locking feature, the Jo-Bolt can replace anchor nuts where a permanent installation is permissible.

The Jo-Bolt comes with nut in place on the end of the bolt. The nut fits on the tapered end of the fastener. Since diameter of the nut is no greater than that of the bolt proper prior to installation, nut can be pushed through the hole with bolt.

After placement, nut is drawn up over the tapered end of the bolt by the screw-jack action of the bolt's threaded sleeve. The sleeve, lipped at the bottom to hold the nut to the tapered end of the bolt, is turned by a standard pneumatic screwdriver or nut setter



Superfine "AA" Insulation now available for the Aircraft Industry

Now Pittsburgh Superfine Fiber Glass is available in "AA" grade—a companion product to its "B" fiber which is also used extensively for aircraft insulation.

Pittsburgh "AA" Superfine is made specifically for the aircraft industry to provide the combination of high insulation efficiency and weight and space factors so essential for many commercial and military aircraft applications. Composed of extremely fine glass fibers, it is manufactured to highest standards under rigid inspection that assures a uniformly high quality insulation.

Pittsburgh Superfine Fiber Glass is backed by the facilities and experience acquired in 70 years of service to industry—the ability to meet the varying requirements of customers' production schedules. Pittsburgh Plate Glass Company, Fiber Glass Division, 420 Duquesne Way, Pittsburgh 22, Pa.

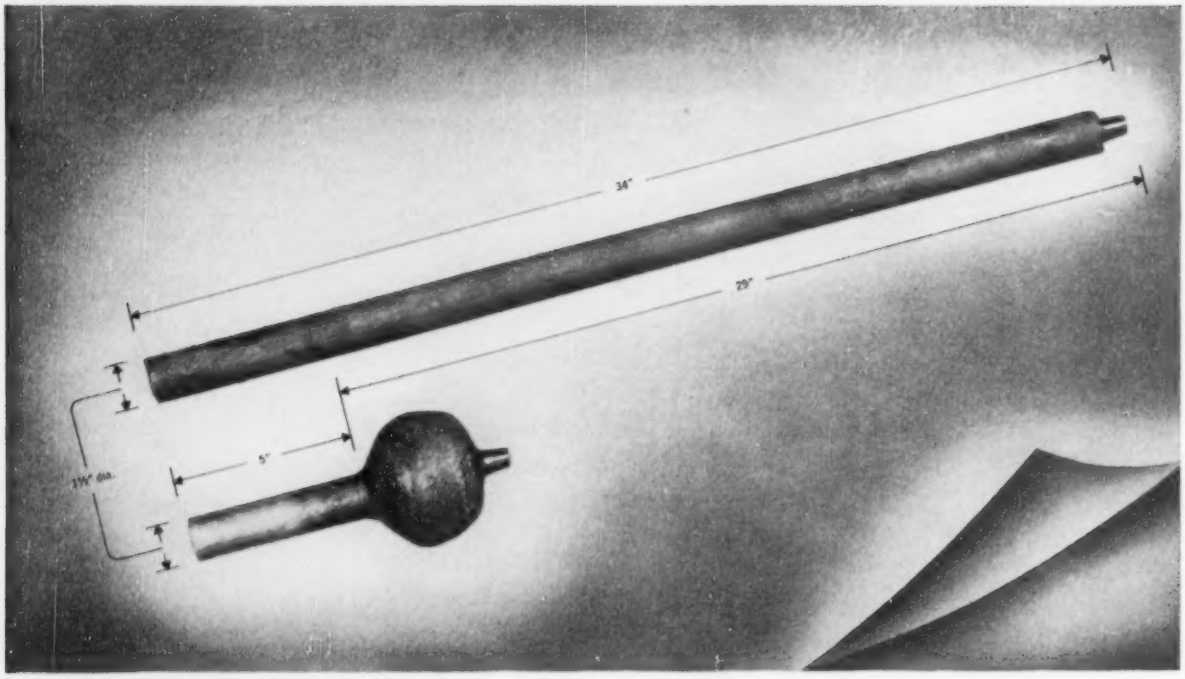
YOUR INQUIRIES ARE INVITED

We will be very glad to provide complete information as to our facilities for serving you. Inquire through our Executive Sales Offices or our District Sales Offices in Chicago, Cincinnati, Cleveland, Detroit, New York or Washington.

FIBER GLASS

PAINTS • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY



UPSETTING some old ideas as to the size of UPSETS!

Any good forging handbook will tell you that unsupported steel can be upset only three diameters. But today's new forging techniques at UTICA have revised that. As example, 29" of this Inconel X 1½" bar were upset into the bulb on the end. This bulb, after precise forging and finishing, will become a very high speed turbine wheel with integral shaft.

UTICA electrical upsetting gives special advantages

Today both old and tough *"new"* metals are being upset—on a production basis—in UTICA'S battery of upsetting machines. Many special forging advantages result—and unique product design gains too. Primarily the upsetting brings greater strength and ruggedness through controlled grain flow. It also makes new designs possible—designs previously impractical. Most important of all, it drastically reduces not only material costs but machining time and costs as well.

A product of the UTICA "Quality First" program

This is just one development in the long range UTICA program—which combines new methods and new machines to mass produce quality forgings...accurate to a very few thousandths... many produced from the *"new"* hard-to-handle metals. Today UTICA production covers jet blades and other defense items—perhaps tomorrow we can serve you with some of the great forging advances developed during the past few years.

Jobs available for technically trained personnel.

Our new folder "File Facts on Precision Forgings" outlines UTICA'S methods and facilities. Send for your free copy today. No obligation.

PRECISION····

U TI CA

TRADE MARK

····FORGINGS

UTICA DROP FORGE & TOOL CORPORATION

UTICA 4, NEW YORK

MAKERS OF THE FAMOUS UTICA LINE OF DROP FORGED PLIERS AND ADJUSTABLE WRENCHES

fitted with a special nose adapter, drawing the nut with it. The end of the sleeve which projects above the flush head of the bolt is then sheared off.

The Jo-Bolt is said to have a shear strength equal to 160,000 psi. heat-treat bolts and about 85% AN bolt tensile strength. Vibration resistance is claimed to be superior to a bolt and locknut combination.

Lok-Fast Inc., Box 508, Sunland, Calif.

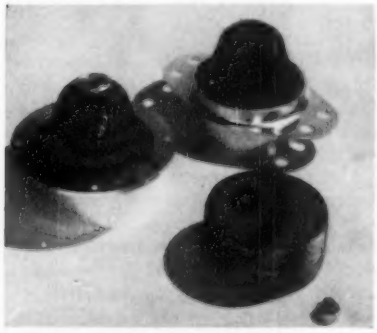
Self-Sealing Rivet

Pastushin Industries has developed a self-sealing aircraft rivet intended to save time and money in production and repair of integral wing tanks, pressurized cabins, hulls, other sealed assemblies.

Fluid-Tight rivets, as they are called, replace standard AN rivets without loss of joint efficiency and have been approved by the Air Force, Navy and CAA, the company says. They provide a better seal than that afforded by conventional means, Pastushin believes. Installation method is conventional.

The self-sealing rivets are modified flush-head AN 426 or round-head AN 430 aluminum alloy types and are produced in various sizes.

Pastushin Industries, Inc., Dept. T., 501 Prairie Ave., Hawthorne, Calif.



Shock Softener

A new shock and vibration isolator, claimed by its developer, Connecticut Hard Rubber Co., to outperform all others, is being tested for use in shipping jet engines and missiles, the company reports.

The mount is designed to protect

The fastest wrench you can put in the hands of a maintenance or production worker. Swiftly runs nuts or screws on or off—cuts costs—makes tough jobs easy. The Snap-on impact wrench delivers up to 2,000 powerful rotary blows a minute without twist or hammer shock to operator. Sets nuts solidly, or quickly reverses to break tough ones loose. ½" square drive takes sockets ⅜" to 1 1/16"—many accessory tools available. 2 models—115 volts, 220/230 volts. Available through Snap-on factory branch warehouses in principal industrial centers. Write for Snap-on Industrial catalog and new catalog of 4,000 hand and bench tools for production and service.

SNAP-ON TOOLS CORPORATION
8020-E 28th Ave., Kenosha, Wis.

*Snap-on is the trademark of Snap-on Tools Corporation.

JIG SAW?
TIME PIECE
WIND SPEED
WIND DIRECTION
BAROMETER
VHF D/F
LOUD SPEAKER
TELEPHONES
SWITCH PANEL
RUNWAY MAP
The puzzle of Air Traffic Control can be solved with an International Aeradio Control Desk. From a temporary structure in the jungle to a major airport control tower, the must in aviation is to control ALL your facilities. The IAL desk gives you finger-tip control of:-
Radio Telephone Hook-ups,
Teletalk Channels,
Meteorological Information,
Time,
Direction Finding Bearings,
Airfield Lights,
Radio Beacons,
Runway Plots,
Instantaneous Alarm Signals,
Airfield Obstructions.
IAL desks are made to measure - they are fitted with what YOU require.

INTERNATIONAL AERADIO LIMITED

40, Park Street, London W.1. (REGent 5024) Cables: Intaerio, London.

AERONAUTICAL OR ELECTRONICS ENGINEERS

Unusual positions for graduate aeronautical or electronics engineers in Flight Operational evaluation and study work. Opportunity to progress with expanding flight research organization, primarily engaged in flight test and development of commercial aircraft instrumentation and flight control equipment.

Position involves intimate association with all phases of flight test activities, including preliminary study work, planning of flight tests and analysis of results. Unlimited opportunity for technical advancement. Location is at MacArthur Airport near Sayville, Long Island, 50 miles east of New York City.

Submit resume to:
Flight Research Dept.

SPERRY GYROSCOPE CO.
Box 218, Ronkonkoma, N.Y.

Facilities Engineer

The position of Facilities Engineer with large West Coast aircraft manufacturer is open to an experienced engineer with extensive background in large-scale manufacturing. Position entails administration of plant planning, construction, equipment, installation, financing and engineering. Give personal history, education, experience, etc., in first letter. Write

P-7860, Aviation Week
68 Post St., San Francisco 4, Calif.

equipment ranging from delicate avionic devices to heavy machinery, and is "unsurpassed" in its capacity to absorb energy of shock load, the company claims. Utilizing the firm's Chorlastic synthetic rubber, it is a non-linear type—it absorbs small vibrations with little deflection. At low loadings it is relatively stiff, but under heavy impacts, serves as a soft cushion. Tendency of the unit to develop resonant frequencies is negligible, according to the manufacturer.

Regarded by the firm as a new approach to the shock isolation problem, the non-linear mount is intended to replace mounting systems consisting of a shear pad and vibration isolator. Units are available with rated loads from ½ to 1000 lb.

Connecticut Hard Rubber Co., 407 East St., New Haven 9, Conn.

Protective Heater

A spot heater has been developed by Westinghouse to protect aircraft instruments exposed to sub-zero temperature.

The unit, weighing 8 oz., supplies concentrated heat to flat surfaces as small as 1x1¾ in. and has a rating of 100 watts. It is a resistance-type element operating on 28 v. d.c. Connections consist of double nut terminals with the negative terminal grounded to the instrument case.

Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.

ALSO ON THE MARKET

Exhaust stains and oily dirt can be removed from wings and wheel wells with Magnus 752 cleaner without brushing and scrubbing.—Magnus Chemical Co., Inc., South Ave., Garwood, N. J.

Better ignition at higher aircraft speeds and altitudes is provided by new ignition exciter. It gives more powerful spark and is one-fourth lighter than predecessors; already approved for use in four production jet engines.—General Electric Co., Schenectady 5, N. Y.

Portable six-channel oscillograph uses Model BL-902A Penmotors for simultaneous recording on all channels of electric or mechanical data.—Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.

Magnetic particle clutch uses stainless steel particles, instead of iron, to give greater stability; lack of wearing parts, fast response and smooth engagement are cited as advantages for the unit.—Clark Mfg. Co., 1830 E. 38 St., Cleveland, Ohio.

Muscular Power

that controls the McDonnell "Banshee"

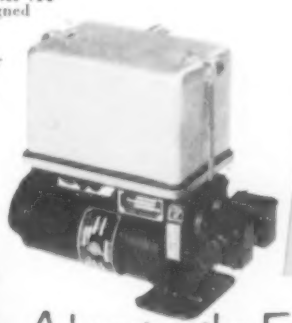
Even before she leaves the deck of a Navy Carrier, her pilot has this swift jet under finger-tip control . . . elevator trim tabs and wing pins moved and positioned by Lear electro-mechanical actuators.

Through Lear drive systems incorporating Screw Jacks, "T" Drives and Flexible Shafting, the Lear Power Unit illustrated transmits the required power.

Engineered to meet the specialized requirements of the "Banshee"... and other well-known aircraft . . . Lear Control and Actuating Systems provide space-saving power. On the "Banshee" such power is at the pilot's instant command through touch of a button or via automatic controls.

In aircraft large and small, military and commercial, Lear Controls, Actuating Systems and Components are making flight smoother, faster, more economical . . . and safer.

LEAR POWER UNIT Series 156
Typical of units designed for the McDonnell F2H-2. Specially developed as a power source, produced to meet specific aircraft requirements.



LINEAR AND ROTARY ACTUATORS

ELECTRO-MAGNETIC CLUTCHES

SPECIAL MOTORS

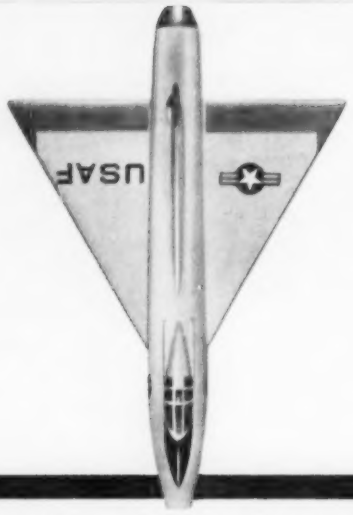
SCREW JACKS

OTHER ELECTRO-MECHANICAL EQUIPMENT:
Electronic Temperature and Positioning Controls • Servo Actuators • Sub-miniature Motors • Dry Powder Clutches • Motor-driven Precision Gear Mechanisms

Advancing the Frontiers of Flight

GRAND RAPIDS DIVISION
110 IONIA AVE., N.W., GRAND RAPIDS 2, MICHIGAN

LEAR-ROMEC DIVISION, ELYRIA, OHIO
LEARCAL DIVISION, LOS ANGELES, CALIFORNIA
LEAR, INCORPORATED, GRAND RAPIDS 2, MICHIGAN



SPECIAL OPPORTUNITIES FOR

SENIOR ENGINEERS

Convair in cool, clean, beautiful San Diego invites you to join an "engineers" engineering department. Interesting, challenging, essential long-range projects in commercial aircraft, military aircraft, missiles, engineering research and electronics development. Positions open in these specialized fields:

Electrical Design	**Servo-mechanisms**
Mechanical Design	**Aerodynamics**
Structural Design	**Thermodynamics**
Structures	**Operation Analysis**
Weights	**System Analysis**

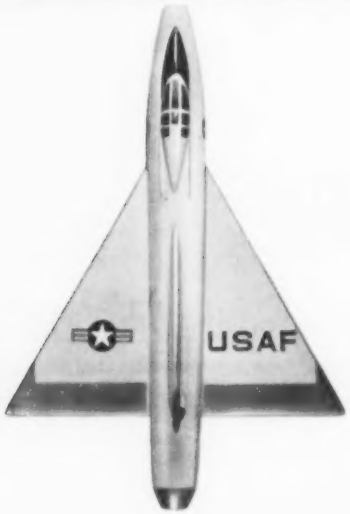
Generous travel allowances to those accepted. For free brochure, write Mr. H. T. Brooks, Engineering Dept. 200

CONVAIR

IN BEAUTIFUL

SAN DIEGO

3302 PACIFIC HIWAY
SAN DIEGO 12, CALIFORNIA



AERODYNAMICIST

STAFF LEVEL ANALYSIS AND EVALUATION DUTIES

We will be satisfied if we get one response from this advertisement because there are not many individuals who . . .

1. have an educational minimum of a B.S. Degree in aeronautical engineering or physics,
2. are experienced in the ballistics of free-falling objects, experiments in wind tunnels or work on the optimum shape of guided missiles,
3. have acquired at least ten years' experience,
4. are capable of performing top level liaison work within the project and with allied groups,

or are . . .

STAFF LEVEL PHYSICISTS

Who

1. have records of graduate academic work,
2. have done development work in mechanics rather than nuclear physics,
3. have a minimum of five years in the direction of research and development,
   (Broad experience rather than intrinsic specialization is preferable.)
4. are capable of performing top level liaison work within the project and with allied groups.

If you can meet such qualifying requirements, write:

THE RALPH M. PARSONS COMPANY

Braddock Heights Maryland

DESIGN RESEARCH DEVELOPMENT

key words to your employment opportunities at GOODYEAR AIRCRAFT . . . pioneer and leader in lighter-than-air craft . . . an established and growing company building an outstanding technical reputation

DESIGN ENGINEERING opportunities exist in the fields of airships, airplanes, and components, airframes, power-plant installations, controls, hydraulics, electronics systems, fuel cells, canopies, and wheels and brakes

DEVELOPMENT of missiles, jet aircraft, and helicopters, electric and electronics system, servomechanisms, fiber resin laminates, and many other projects present an urgent need for capable engineers

WELDING ENGINEERS, civil engineers, mechanical engineers with ability in metals fabrication, and industrial engineers experienced in time study are needed. Job opportunities also exist for technical editors and illustrators

POSITIONS are open at several levels, and inquiries are also invited from recent graduates. Salaries are based on education, ability, and experience

PAID VACATIONS, free group life insurance, a good hospitalization plan, paid sick leave, company-sponsored pension plan, planned recreation, and free parking are among the facilities at the plant

A FRIENDLY CITY, Akron, Ohio, is located in the center of the midwestern industrial region

IF YOU ARE INTERESTED in a secure future, write, giving details, or request an application from

C. G. Jones, Salary Personnel Department

GOODYEAR AIRCRAFT CORPORATION, 1210 Massillon Road, Akron 15, Ohio

We desire personnel of the highest caliber—experienced in the field of airborne automatic electro-mechanical control equipment.

★

ENGINEERS

MECHANICAL DESIGN
ELECTRONIC
SERVO

DESIGNERS-LAYOUT MEN

ELECTRONIC
MECHANICAL

This work deals with the manufacture and development of highly complex equipment of the most advanced type in a new and expanding division of an established firm with 20 years of successful experience in the precision instrument field.

We cite a few of the good reasons why you might like to join our organization . . .

SALARY increases are based on merit and initiative—two weeks VACATION, HOSPITALIZATION BENEFITS, GM's own INSURANCE PLAN—POSITIONS ARE PERMANENT due to long range manufacturing and developing programs—EXPENSES incident to interviews and moving all absorbed by company—HOUSING and LIVING CONDITIONS among the best and finest of any along Lake Michigan.

- We have a Junior Engineering Training Program of one year for inexperienced engineering graduates. Opportunity to become acquainted with all phases of industry.
- For the convenience and direct use of engineers in our Engineering Department, we have our own model shop where highest skilled mechanics are employed.
- Educational opportunities for advanced degrees available at U. of W., Marquette, Technical engineering offered at Milwaukee Vocational School.

. . . all inquiries answered—write or apply . . .

★ *AC SPARK PLUG DIVISION*

GENERAL MOTORS CORPORATION

1025 E. KENILWORTH PL. MILWAUKEE 2, WIS.

Engineering and Sales Representation

Engineering organization equipped to apply, sell and service your products to major east coast and Canadian aircraft and accessory manufacturers.

Military Liaison and Market Research programs conducted.

RA-7931, Aviation Week
330 W. 42 St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

DESIGN ENGINEERS needed by Gladden Products capable of carrying a job through from the board to production. You are in full charge, no red tape or conventions. If you are interested in practical design engineering on pneumatics or hydraulics, here are constructive interesting positions with a future based only on personal ability. Gladden Products Corporation, 635 W. Colorado Blvd., Glendale 4, California.

POSITIONS WANTED

EXECUTIVE PILOT, 12 years experience in aviation including Airlines. Airline Transport Rating. Age 31, married. Presently employed. PW-7794, Aviation Week.

REPRESENTATIVE OR Gov. Contract Admin. —B.A. & M.B.A. Degrees. 14 yrs. Acft. exp. Sales & Serv. Mgr. prominent Acft. & Eng. Mfg.; Civ. Buyer, Air Force Equip., Wright Field; World War II Prod. Officer, AF Factory Rep. & Test Pilot. Desire association with Avia. Div. of Commercial Equip. Org. Opportunity important. Current salary $8,300.00. Brochure avial. PW-7910, Aviation Week.

CO-PILOT MECHANIC desires position on executive aircraft. Commercial Pilot, Single and Multi-Engine Land. Instrument and Instructors ratings. Over 5000 total Hrs. A & E thirteen years. 34 years old, married with two children. Previous experience on executive aircraft. Available now. PW-7912, Aviation Week.

FLIGHT ENGINEER position wanted. 3000 hrs. as flight engineer on airline 4 engine equip. Hold recent CAA airman physical and CAA flight engineer written on parts, 1, 2, and 3, October 1952. FCC restricted-phone licensed A&E for 13 yrs. 7 yrs. airline experience, including maintenance, and flight time. Age 33. Available immediately. PW-7689, Aviation Week.

PILOT—COMMERCIAL with all ratings—Qualified DC-3, DC-4, DC-6 with major airline experience as co-pilot and flight engineer. B.S. Aero. E. degree. Total pilot time: 2700 hours. Total flight engineer time: 2000 hours on DC-6 and B-29. Ground school instructor ratings in navigation, meterology, aircraft engines, radio navigation. Married, Age 30. Will locate. PW-7952, Aviation Week.

BUSINESS OPPORTUNITIES

Will buy—

100% inactive aviation corporation with established carry-over tax loss, no debt. BO-7714 Aviation Week.

Helicopter Service Wanted.

The uranium boom in the Athabasca Lake, Saskatchewan area is based on actual proven values. The Government has completed a 17 million dollar mill to process ore for surrounding mines. Thousands of acres staked last winter require radioactive surveys. Wonderful opportunity for charter service and staking uranium claims on the side. If you have the Helicopter and pilot we have the other requirements. Rush inquiry and information to A. R. Means, 1658 River Road, Jacksonville, Florida.

FOR SALE

3 Westland Sikorsky S/51 Helicopters,

Pratt & Whitney engines, metal blades servos, extremely low hours. Airline operation and maintenance. Full spares including 3 Pratt & Whitney engines. Address the inquiries to FS-7942, Aviation Week.

California Opportunity

For Acoustics and Vibration Engineers

To conduct tests and analyze problems in acoustics and vibration fields related to aircraft and associated products.

FOR FLIGHT TEST ENGINEERS

To engage in planning, testing and analysing flight test data obtained on Douglas prototype commercial and military aircraft.

Salary open and dependent on experience and ability.

Contact Mr. W. H. P. Drummond, 3000 Ocean Park Boulevard, Santa Monica, California. Phone: Exbrook 4-3241. Extension 339.

DOUGLAS

DOUGLAS AIRCRAFT COMPANY, Inc.

SANTA MONICA, CALIFORNIA

The New Scientfic Research Laboratory of the Ford Motor Company

has openings for

DESIGNERS
DRAFTSMEN
ENGINEERS

to research, design and develop automotive gas turbine and other advanced propulsion systems.

Qualifications:

A minimum of two years' experience in design and development of mechanical devices preferably related to propulsion.

FORD MOTOR COMPANY

Engineering Personnel

Oakwood Boulevard

West Dearborn Michigan

FUTURE HELICOPTER PASSENGER PROGRAM HAS OPENINGS FOR

Helicopter Pilots, Mechanics, Electrical, Communications, and Accounting Personnel

Address reply direct to:

LOS ANGELES AIRWAYS, INC.

Box 10155 Airport Station. Los Angeles 45, Calif.

SKILLED

PILOTS

AVAILABLE

No Fee to Employers

PILOTS EMPLOYMENT AGENCY

Teterboro (N. J.) Airport

Hasbrouck Heights - 8-1001

OPPORTUNITY
FOR
JET POWER PLANT ENGINEER
IN
TULSA, OKLAHOMA

Qualified to Design and Analyze Aircraft Turbo Jet Power Plant Installations, Fuel and Lubricating Oil Systems and Components

Administrative Abilities Desired

Salary Open and Dependent Upon Experience and Ability

Direct Inquiry to
J. L. JOHNSON
Engineering Personnel Manager

DOUGLAS

DOUGLAS AIRCRAFT COMPANY, Inc.
Tulsa Division
TULSA, OKLAHOMA

MECHANICAL ENGINEERS SPECIALIZED IN SMALL MECHANISMS

PHYSICISTS

SALARIES OPEN

Research and Development

SEND RESUME TO

THE RALPH M. PARSONS COMPANY
BRADDOCK HEIGHTS, MARYLAND

to weight engineers:

Lockheed

in California offers you

a better job

in a better place to live!

There's a better job waiting for you at Lockheed – in an area where living conditions are beyond compare.

On the job, you work in fine, modern offices. You associate with top men in your profession – men who have helped Lockheed earn its reputation for leadership. You receive an excellent salary – up to $130.50 per week.

Furthermore, you build for the future at Lockheed. Its backlog of orders – for commercial as well as military aircraft – and long-range development program insures your future with the leader in aviation.

Off the job, you live in an area where recreational opportunities are unrivalled – where outdoor life is possible the year around.

Requirements for a job and a future at Lockheed are: A minimum of seven years' training and experience and three years' experience in weight analysis work. Applications from Weight Analysts will also be considered.

Note to men with families: Housing conditions are excellent in the Los Angeles area. Thousands of rental units are available. Thousands of homes have been built since the last war. Huge tracts for home ownership are under construction now. Lockheed counselors help you get settled.

Send today for illustrated brochure describing life and work at Lockheed in Southern California. Use handy coupon below.

Weight Engineers Program
Mr. M. V. Mattson,
Employment Manager, Dept. AW-5-W

Lockheed
AIRCRAFT
CORPORATION
BURBANK, CALIFORNIA

Dear Sir: Please send me your brochure describing life and work at Lockheed.

My name

My address

My city and state

My occupation (type of engineer)

TEMCO AIRCRAFT CORPORATION

Dallas, Texas OFFERS

ENGINEERS

and OTHER TECHNICAL PERSONNEL

GOOD POSITIONS IN

AERODYNAMICS
ARMAMENT
LOFTING
CONTROLS
STRUCTURES
FLIGHT TEST
ELECTRICAL INSTALLATION
POWER PLANT INSTALLATION
FLUTTER & VIBRATION
ANALOGUE & DIGITAL COMPUTERS
ENGINEERING PROCEDURES & PLANNING

EXCELLENT OPPORTUNITIES

HOUSING READILY AVAILABLE

ATTENTION ENGINEERING PERSONNEL

BOX 6191, DALLAS, TEXAS

OUTSTANDING ENGINEERING OPPORTUNITY

Are you a specialist or a recent graduate proficient or interested in one or more of the following fields?

- Aero-thermodynamics
- Internal Aerodynamics
- External Aerodynamics
- Ballistics
- Ram Jet and Turbo Jet Test and Performance
- Transonic and Supersonic Test Operations
- Turbine and Compressor Design

Sverdrup & Parcel, Inc. is engaged in the design of advanced and unusual aeronautical test facilities which require the theory and application of these special fields. The wide variety of our work, embracing the design of general industrial facilities of all types, offers challenging problems and provides excellent opportunity for individual development and advancement. Starting salary and extent of responsibility are dependent upon individual ability and experience. Fringe benefits include: an unusually attractive Employee Benefit Plan which furnishes insurance features and provides for retirement; paid vacations, holidays and sick leave; overtime rates; and an employees' club which offers interesting social and practical values. Two accredited universities offer opportunity for advanced education.

Your letter of inquiry will receive prompt attention and reply. Please write to—

SVERDRUP & PARCEL, Inc.
Consulting Engineers
915 Olive — St. Louis 1, Mo.

ELECTRONICS ENGINEERS WANTED SOUTHERN CALIFORNIA

Attractive opportunities offered to Engineers experienced in and qualified to design aircraft flush antennas and radomes.

Complete modern facilities for laboratory testing and evaluation available.

Salary dependent upon experience and ability.

Contact Mr. J. C. Buckwalter,
Chief Engineer

DOUGLAS

DOUGLAS AIRCRAFT COMPANY, Inc.
Long Beach, California

For Unmatched Quality In *PAINT JOBS—schedule your aircraft with MALLARD

* done with painstaking care by our Paint Specialists who really know paint. Colors and design to your individual or Corporation preference. We're proud of our paint jobs and feel you will be, too. For full details why not Write or Phone us NOW!

MALLARD INDUSTRIES, INC.
Dept. P
Bridgeport Municipal Airport
Stratford, Conn.
tel: Bridgeport 78-0491, 0492
Hasbrouck Hts., N. J. 8-1404

obtain your CAA
AIRCRAFT DISPATCHER
rating in four months
CAA approved course available under GI Bill
Other courses
Flight Navigator-Pilot Ground School
Airline Stewardess-Link Instructor
Link Training instruction for pilots
EASTERN AIR NAVIGATION SERVICE
157 West 54 Street New York City

EXECUTIVE TRANSPORT AIRCRAFT
BUYING OR SELLING
Either way our 29 years of experience and nation-wide contacts are at your service in Personal, Executive and Transport Aircraft.

JIM WELSCH
AIRCRAFT SALES
60 East 42nd Street, Suite 628
New York 17, New York Murray Hill 7-5884

WINGS FIELD AMBLER, PA. **WINGS, INC.** PHILA. INTL. AIRPORT
AIRCRAFT SALES & SERVICE SINCE 1929
Consult Us with Confidence before BUYING or SELLING any type aircraft
You Pay Nothing for Our EXPERIENCE and INTEGRITY
AMBLER 1800

Stinson SR9F Reliant

Serial 5708, with newly remanufactured R985-AN14B engine; just recovered; propeller, carburetor, fuel pump, vacuum pump, fuse junction box and radio overhauled, interior wood structure and metal frame cleaned and painted; gas tanks removed and overhauled; all gas and oil hose replaced; new aircraft bolts installed on all component parts. Total time 6646 hours. SHIP JUST RELICENSED. Price $7,000 flyaway Newark Airport.

THE BABB COMPANY INC.
104 E. Peddie St. Newark, N. J.
1007 Airway Glendale, Calif.

UNUSUAL OPPORTUNITIES

can be found each week in the

SEARCHLIGHT SECTION OF AVIATION WEEK

UNUSED AIRCRAFT PARTS

Save time—save money—buy unused aircraft parts from one of the largest most diversified warehouse stocks in the country!

Quan.	Part No.	Mfg.	Description
20	36001-0	Eclipse	Compass
11	14601-1F-B1	Eclipse	Gyro Indicator
10	15401-1	Eclipse	Amplifier (PB10) w/ED3 MOUNT
52	10078-1AG	Eclipse	Gyro Indicator
62	CQ-9	Eclipse	Clutch Switch (PB10)
11	12086-1C	Eclipse	Amplifier
19	15100-1B-A1	Eclipse	Pitch Trim Gauge
8	20000-43A-13A1	Eclipse	Magnesyn Transmitter
67	23000-2A	Eclipse	Magnesyn Indicator
15	22101-11-A4	Eclipse	Pressure Trans.
6	2226-11C-3A	Eclipse	Dual Tach.
9	20100-42B-14A2	Eclipse	Torque Ind.
9	20000-8A-14	Eclipse	Magnesyn Pos. Ind.
23	20100-11C-4-A1	Eclipse	Wing Flap Indicator
11	DW-33	Eclipse	Transformer
23	CQ-2	Eclipse	Switch Box
75	1195-4-A	Eclipse	Vibrator
80	DW-28	Eclipse	Transformer
11	2227-11-D3A	Eclipse	Tachometer
75	1416-12E	Eclipse	Starter
100	716-3A	Eclipse	Generator (NEA-3A)
384	564-2A	Eclipse	Oil Separator
71	828TY13Z2	Weston	Oil Temp. Indicator
40	119862	Weston	Carb. Air Temp. Indicator
400	AN5780-2	Weston	Wheel & Flap Position Indicator
1000	AN5780-2	G.E.	Wheel & Flap Position Indicator
40	828TY12Z2	Weston	Dual Carb. Temp. Gauge
11	727TY70Z2	Weston	Air Temp. Ind.
85	727TY79Z2	Weston	Air Temp. Gauge
88	727TY73Z2	Weston	Air Temp. Gauge
83	727TY74Z2	Weston	Air Temp. Gauge
10	728-40Z2	Weston	Air Temp. Gauge
21	8DJ29AAY	G.E.	Cowl Flap Ind.
22	77C5	Lewis	Carb. Air Temp.
16	76B19	Lewis	Cyl. Head Temp.
23	77C3	Lewis	Oil Temp. Gauge
13	77C4	Lewis	Oil Temp. Ind.
30	47B21	Lewis	Free Air Temp.
33	47B22	Lewis	Air Temp. Gauge
28	47B23	Lewis	Air Temp. Gauge
54	47B24	Lewis	Air Temp. Gauge
22	906-6-011	Kollsman	Diff. Press. Gauge
48	254BK-6-052	Kollsman	Diff. Press. Gauge
33	DW-47	Eclipse	Transformer
46	117-47	Edison	Fire Detector
19	117-10	Edison	Control Box
200	981280	Kidde	CO2 Cylinders
43	966090	Kidde	Interconnector
104	966679	Kidde	Pressure Control
225	981591	Kidde	Tee
151	A-4614	Kidde	Switch
47	M870036B	Kidde	CO2 Cyl.
74	923748	Kidde	Oxygen Cyl.
326	982585	Kidde	Valve
325	AN60009-1B	Oh. Chem.	Valve
247	AN6009-2A	Oh. Chem.	Valve
47	2-1046-76	Parker	Valve (3000 PSI)
115	P4CA2A	Parker	Primer
68	SP4-2746-77	Parker	Restrictor Valve
105	SP4-2746-78	Parker	Restrictor Valve
68	6-746-10	Parker	Valve
40	SP4-2746-79	Parker	Restrictor Valve
48	SP-2746-80	Parker	Restrictor Valve
60	SP4-2746-81	Parker	Restrictor Valve
127	PL2-2546-75	Parker	Cone Check Valve
123	PI2-2546-76	Parker	Cone Check Valve
620	PL2-2546-77	Parker	Cone Check Valve
540	PL2-2546-78	Parker	Cone Check Valve
142	SP4-2746-76	Parker	Restrictor Valve
112	PLY-843-54	Parker	Check Valve
23	PL2-1846-77	Parker	Check Valve
120	MF9-713-15A	Vickers	Hydraulic Pump
124	PF12-713-25BCE	Vickers	Hydraulic Pump
10	PF9-2713-20Z2	Vickers	Hydraulic Pump
327	PF4-713-20BCE	Vickers	Hydraulic Pump
57	MF45-3911-20Z	Vickers	Hydraulic Pump (3000 PSI)
28	AA31400	Vickers	Valve
125	D7818	Adel	Anti-Icer Pump
250	AN4014	Erie Meter	Wobble (D-3) Pump
45	AN4103-2	Clifford	Brass (Valve #U4785) Oil Cooler
70	AN3213-1	Scintilla	Ignition Switch
250	A-9 (94-3226)	Nesco	Ignition Switch
66	M862A	Jos. Pollack	Master Switch
148	PG208AS1	Honeywell	Switch Air Ram
40	PG208AS7	Honeywell	Air Ram Switch
18	4582-AA-6C	Dynamic Air Eng.	Blower
24	U-702-15	Joy Mfg. Co.	Blower
20	V301B7	Aerotec	Pressure Relief Valve
419	450	Skinner	Filter
287	1033-4E1	White-Rodgers	Heater Control Switch
126	17322-2	Fenwall	Thermo Switch
34	9804B	Vapor Car Heating Co.	Control Box
25	468311	Vapor Car Heating Co.	Compensator
202	A812	Interstate Aircraft & Eng. Co.	Solenoid
46	146102	Bendix	Valve (0-500 PSI)
240	1265-900	Airex	Relief Valve
29	HC2109	Air Associates	Hyd. Cylinder
8	HC2110	Air Associates	Hyd. Cylinder
53	AN6203-3	Bendix	Accumulator10"-1500 P.S.I.
90	JH950-R	Jack & Heinz	Starter Motor
140	K14949E	Marquette	Windshield Wiper Kit
188	EYLC-2334	Barber-Coleman	Control
230	921-B	Stewart-Warner	Heater (200000 BTU)
22	0655-D	Aro	Oxygen Regulator
65	ASDC2	CO2 Mfg. Co.	Fire Detector
97	6041-H-146A	Cutler Hammer	Relay (B-12)
237	6141-H69A	Cutler Hammer	Circuit Breaker
47	7264-404	Leach	Relay
22	M-2031	Air Associates	Actuator
11	FYLD2516	Barber-Coleman	Thermostat
51	AYLZ2284	Barber-Coleman	Micropositioner
20	72400	Ham. Stand.	Prop. Reversing Control
10	5X18	Woodward	Governor
46	A14-A-9708P	Westinghouse	Contractor
26	70G3	G.E.	Transformer
718	B2A	Square D	Relay
6	83A9	Surface Combustion Co.	Heater
115	C6363-1-5A	Spencer	Circuit Breaker
115	C6363-1-2A	Spencer	Circuit Breaker
33	18784	Adel	Restrictor Valve
1700	AM1614-80	Heinemann	Circuit Breaker
31	BOBX-2	Allied	Relay
85	12924-2	Adel	Lock Valve
805	58G926	G.E.	Ballast Core & Coil
140	58G946	G.E.	Ballast
40	7210-24	Leach	Relay
66	25432	Airesearch	Flex. Cable
518	MT48C	Bendix Radio	Insulator
20	M-101-3	Aerotec	Pressure Switch
12	MT68EG	Bendix Radio	Mount
52	715E	Fulton Syphon	Temp. Control
478	D9530	Adel	Selector Valve
668	D9530-2	Adel	Selector Valve
428	D9560-2	Adel	Selector Valve
179	D9632	Adel	Selector Valve
237	D9696	Adel	Selector Valve
744	D10044	Adel	Selector Valve
244	D10051	Adel	Selector Valve
814	74247 (TY, PH3)	Aero Supply	Valve
335	AN5830-1	Whittaker	Valve
74	AN5830-6	Whittaker	Valve
60	AN5831-1	Parker	Valve
130	612-4A	Eclipse	Valve
2200	37D6210 (AN4078-1)	United	Solenoid Valve
1988	K1593-6D	Kohler	Valve
500	NF3-5	Mallory	Noise Filter
20	TA-12B	Bendix Radio	Transmitter
35	RA10-DB	Bendix Radio	Receiver
2585	AN3096-4	Grimes	Dome Light
775	AN3096-5	Grimes	Dome Light
1365	AN3096-6	Grimes	Dome Light
6	610-2C	Eclipse	Vacuum Pump
550	PD12K10	Stromberg	Carburetor
236	PR48-A1	Stromberg	Carburetor
90	1685-HAR	Holley	Carburetor
19	1375F	Holley	Carburetor
407	SF9-LN-2	Scintilla	Magneto
185000	LS4-AD1	Aero	Spark Plug
1	R1820-52	Wright	Engine
16	R1820-54	Wright	Engine
4	R1820-60	Wright	Engine
1	R1830-43	P & W	Engine
166	1045A	P & W	Bearing
500	3506	P & W	Flange
130	8288	P & W	Follower Ass'y.
814	35814	P & W	Blower Ass'y.
53	48362	P & W	Shaft
75	48363	P & W	Shaft
56	48392	P & W	Sump
390	48461	P & W	Gear
78	76236	P & W	Gear
1178	84289	P & W	Bearing
113	84487	P & W	Housing
77	84591C	P & W	Nose Housing
200	48350-D	P & W	Crankcase Ass'y
200	84083	P & W	Cylinder
100	84084	P & W	Cylinder
200	84085	P & W	Cylinder
281	CR2791-G100-K4	G.E.	Relay
626	CR2792F101-A3	G.E.	Relay
41	G34464	Guardian	Relay
350	G31502-A	Guardian	Relay
22	146102	Vickers	Brake Valve
9	557-5	Eclipse	Check Valve
107	D12296	Adel	Pump
67	19100-2-101B	Kenyon	Check Valve
88	3135-11C	Eclipse	Pressure Switch
32	3V-217-HC	Pesco	Separator
100	27314	Purolator	Oil Filter
128	3801-3B	Eclipse	Fuel Quan. Gauge
33	420313	Wright Aero	Pump Ass'y.
46	416421	Wright Aero	Drive Ass'y.
76	U635A (AN4000-2B)	U.A.P.	Fuel Strainer
12	U8416-MM	U.A.P.	Oil Cooler Ass'y.
25	26675	Airesearch	Motor
35	AA14002A	Vickers	Accumulator
21	FD65-5	Diehl	Motor
81	3616	Bendix Radio	Control
23	3620	Bendix Radio	Station Box
335	G1 (94-32376)	G.E.	Oxygen Pressure Signal Ass'y.
180	AW-CV-1-1	U.S. Gauge	Check Valve
740	1C-200	G.E.	Radio Noise Filter
15	1EAR-280BH	Pesco	Pump
7	SP-1-445-8	Parker	Selector Valve
8	1E621	Pesco	Pump
29	NEP-2	Eclipse	Auxiliary Power Unit
16	LER-30D	Lawrence	Auxiliary Power Unit
4	2CM46A2	G.E.	Generator
6	2P248EB	Pesco	Fuel Pump
21	2E258SA	Pesco	Pump
146	AW2-3/4-25K	U. S. Gauge	Manifold Press Gauge (Metric)
27363	CREB3N	Casco	Rod End
18	SA/3A	Kidd	Impact Switch
13	3GBD1A18A	G.E.	Regulator
18273	AN200-K3L2	Fafnir	Bearing
245	LMR-4	Micro	Switch
2094	PM-5	Spencer	Circuit Breaker
44	5BA25D-J4B	G.E.	Motor
31	5AM31JJ9A	G.E.	Amplidyne
111	5AM31NJ10	G.E.	Amplidyne
425	5BA40NJ1A	G.E.	Motor
189	5PD65-MB1	G.E.	Motor
25790	NR6L12	Torrington	Bearing
26	MS49A	Bendix Radio	Antenna Switch
45	D2060	C. P. Clare	Relay
298	727-TY37P	Weston	Air Temp. Ind.
2000	8909-K99	C. H.	Switch
2747	NAF310310-4B	Cannon	Plug
402	NAF310310-5B	Cannon	Plug
132	AN6209-B	Hydro Aire	Valve
50	AN6213-2	Bendix	Hyd. Valve
280	AN6220-4	Aeroquip	Couplings
27	AN6247-2	Adel	Hyd. Valve
14	UA8013-MM	United Aircraft Prod.	Oil Cooler
1175	RS-2	Mallory	Selector Box
172	A7012	Delco	Motor
6	8DJ13ABK	G.E.	Tachometer Indicator
200	2222-1F-2A	Eclipse	Tachometer Indicator
28	AN5770-2	Manning Maxwell Moore	Manifold Pressure Gauge
71	1003-4	Eclipse	Generator
427	NAF1016-1	Adams & Westlake	Light Ass'y.
616	NAF1016-2	Adams & Westlake	Light Ass'y.
1008	1222BF	Leach	Relay
751	B1392T	Teleflex	Gear Box
130	B1394T	Teleflex	Gear Box

COMMERCIAL SURPLUS SALES CO.

4101 CURTIS AVENUE, BALTIMORE 26, MARYLAND **TELEPHONE: CURTIS 7-3300**

PV-1 SPECIAL

PRIVATE EXECUTIVE PLANE

ONLY $29,950 Courtesy to brokers

Year-end clearance makes possible this ridiculously low price. In perfect A-1 condition. Built by Lockheed. Airframe total time: 263 hours. Pratt & Whitney R2800-31 engines. Cruising speed, 10,000 ft.: 250 to 270 mph true. Cruise 7 hours to 1,500 mile range with reserve. Carries 8 passengers plus crew. Dual controls. Two-way military radio equipment. New license. 100 hr. check completed. For full information, phone or write:

AiRESEARCH AVIATION SERVICE CO.
5907 W. Imperial Highway
Los Angeles, Calif. ORegon 8-2661

FOR SALE

LOCKHEED VENTURA PV-1

Finest Corporation Airplane Available. Fully converted; Deluxe interior; Very latest equipment; including A-12 Auto-Pilot with Automatic approach; ten passenger capacity; cruising speed 260 MPH; 2,000-mile range. In use by Midwest Manufacturer. Available immediately. No Brokers. Address inquiries to:

FS-7738, Aviation Week
520 N. Michigan Ave., Chicago 11, Ill.

FOR IMMEDIATE SALE

BEAUTIFUL DEHAVILLAND DOVE

one of finest Dove's ever on the market

- IN EXCELLENT CONDITION
- DE LUXE EXECUTIVE INTERIOR
- MANY INDIVIDUAL EXTRAS
- SPARES INCLUDED

Paint job will be done to your individual or corporation color and design preference

WRITE • PHONE • WIRE
US NOW! FOR COMPLETE DETAILS

EASTERN AIRCRAFT SALES CORP.
15 Moore Street, N. Y. C.
Tel: Hanover 2-0668—0669

Lockheed Lodestar

18-56, in conversion, zero time SOH on airframe, engines, and props., bulkhead behind pilot removed, interior to customer's specifications, engine type optional, complete deluxe radio.

Executive D-18-S Beechcraft,

150 hrs. since 1000 hr. overhaul airframe and hydromatic props., 300 hrs. TSO-14B engines, deluxe radio, radio panel, and interior; super soundproofing, aeroquip, de-icer and anti-icer, 80 gal. nose tank, immediate delivery.

AMERICAN AIRCRAFT CORP.
Teterboro, N. J. HA 8-0279—8-1482

FOR SALE

DeHavilland Dove

800 hours since new
350 hours since engine change
New Propellers.

Inquire

Signal Oil & Gas Co.
811 W. Seventh St.
Los Angeles 17, Calif.

Over 20 Years Airline Experience now serving
Executive and Corporation Aircraft
PRATT & WHITNEY WRIGHT
Home of the P&W R1830-Super-92

ENGINE WORKS

LAMBERT FIELD INC. St. Louis, Mo

INSTRUMENTS

Authorized Factory Sales for and Service

*** Eclipse—Pioneer**
*** Kollsman**
*** U. S. Gauge**

C.A.A. Approved Repair Station #3564

Contractors to U. S. Air Force

Our stock of instruments is one of the largest in the East.

IMMEDIATE DELIVERY

CALL • WIRE • WRITE

INSTRUMENT ASSOCIATES

Telephone: Great Neck 4-1147
351 Great Neck Road, Great Neck, N. Y.
Telegraph: WUX Great Neck, N. Y.

GRUMMAN MALLARD

Corporation owned, executive Mallard for sale by original owner. **1850:00** total time since new. Mechanically perfect and relicensed until March, 1954. Right engine **375:00** and left engine **125:00** since overhaul. Two zero time engines, set of jacks, cradles and stock of spare parts. Latest radio equipment includes 50 channel ARC-1, ADF, Omni, ILS, Ship to shore, T-11 Transmitter, marker beacon, and low frequency.

Address replies to:

Air Transport Department
R. M. HOLLINGSHEAD CORPORATION
840 Cooper Street Camden, N. J.

AIRLINE SEATS

for DC3—DC4—DC6, and Lockheed Constellation
Warren McArthurs, Hardman, Douglas and Payloads. LO and HI density — Singles, doubles, triples. Delivery from stock.
TRANSPORT AIRCRAFT—ENGINES
A. K. Rozawick, Pres.

AIRLINE EQUIPMENT CORP.

SUITE 704 - ROCKEFELLER CENTER
610 FIFTH AVE., NEW YORK 20, N.Y.
Circle 5-6920-6921
NEWARK AIRPORT NEWARK, N.J.
MARKET 2-0963-4

NEW EXECUTIVE LODESTAR

New conversion with beautiful new executive interior. Perfect for corporation and ready to go. Would accept Twin Beech in trade.

PAGE AIRWAYS, INC.
Rochester Airport Rochester, New York
Genesee 7301

FOR SALE
DC-4's—DC-3's
Lodestars—B-25J
Contact us for details
No charge for listing your aircraft
WESTAIR (Dept. AW)
WESTCHESTER COUNTY AIRPORT
White Plains, N. Y. WHite Plains 6-5720

HAMILTON-STANDARD

Propellers 2B20/6135A-9 & -15, Blades 6101A-12, 6135A-9 & -15 6137A-15 & 6487A-6, Hubs 2B20/229, 2D30/247, Spinners 2D30, Governors 1A2, 1A4, 1M12 & 4G8, C/W Bracket 51430—All Items new or C. A. A. Certified.

AERO PRECISION INDUSTRIES
Box 5117 Oklahoma City 7, Oklahoma

BEECHCRAFTS

Excellent used Twins and Bonanzas. Guaranteed to be as represented. For the best used BEECHCRAFTS, contact your - BEECHCRAFT DISTRIBUTOR -
ATLANTIC AVIATION CORPORATION
Teterboro Airport, Teterboro, N. J.
Tel: Hasbrouck Heights 8-1740

FOR DC-3's SALE

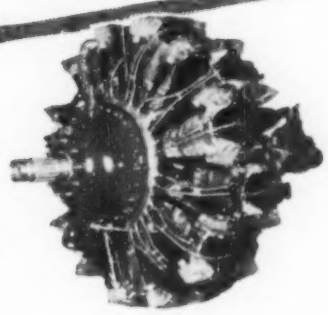
We own and have available for immediate sale several low time Eastern Airlines DC-3. They are fully equipped for scheduled airline operation. All are equipped with full radio, Airstair Door, Jantrol Heater. Available immediately. Can be inspected Miami, Fla., or Fort Wayne.

LEEWARD AERONAUTICAL
Miami, Fla. Phone 64-4364
Fort Wayne, Ind. Phone H-2145

NAVCO, Inc., HAS IN STOCK
for Executive Aircraft

New, Factory Fresh
Goodrich (Hayes) Brakes for DC-3, C-47
Deicer Boots for DC-3, C-47, D18, Lodestar, PV1
AN3025-1 Relays, reverse current
1589 Bendix latest Voltage Regulators
A.R.C., Bendix, Collins Executive Radio
AIREX SERVICE—phone Terryhill 5-1511
Lambert Field St. Louis Missouri

Unused
PRATT & WHITNEY R1830 ENGINES



For your inspection and selection — unused engines, newly converted, fully certified and accompanied by original records, CAA form 337s, carburetor flow test sheets, inspection reports and test run reports. All CAA and Pratt & Whitney factory bulletins are complied with and all work performed in one of the four AUTHORIZED Pratt & Whitney overhaul shops in the United States.
Prices quoted are f.o.b. Newark, N. J. or New York pier, packed for export. Engines are subject to prior sale and we urge you to send for details while the supply lasts.

R1830-92

Unused engines with no operating time. Complete log records. Meet all air carrier requirements. Warranty included. Genuine unused -43A engines newly converted to -92 by installation of freshly overhauled -92 rear crankcase assemblies and carburetors **$4500**

R1830-43A

Unused engines suitable for immediate operation "as is" or conversion to -92 in your own shop. Original log records. Periodically inspected by authorized Pratt and Whitney facility for satisfactory condition and preservation **$3500**

Many other engine models also immediately available. Prices quoted on request.

Look to Us for

AIRCRAFT • ENGINES • PROPELLERS
RADIOS • ACCESSORIES • INSTRUMENTS • SHOP EQUIPMENT • TOOLS
WHEELS AND BRAKES • PACKING, ETC.

THE Babb COMPANY, INC.
104 E. REDDIE ST. NEWARK 1, NEW JERSEY
1007 AIRWAY GLENDALE 1, CALIF.

Operators Set Up Copter Specs

Government assistance in developing knowledge of the economic and operating characteristics of rotary-wing transport aircraft received strong support from copter manufacturers and operators attending International Air Transport Assn.'s recent sixth technical conference at San Juan, Puerto Rico.

It was felt that these characteristics could be ascertained best if governments would undertake a program of accelerated testing of prototypes in simulated operation.

▶ **New Prototypes**—Transport helicopter operators from the United States and Europe heard manufacturers discuss the wide variety of models under development, ranging in size from 14 to 60 seats with powerplants including piston engines, turbines, turboprop and rotor-tip jets. Cruising speeds of these models were cited at 75 to 170 mph. Production dates are from eight months to more than three years away.

Approximate costs, some hypothetical, for production models were estimated at from $200,000 for a 14-seat copter to $500,000 for a 36-place craft. Figures for direct operating costs ranged from 25 to 35 cents per ton-mile for the larger aircraft.

▶ **Performance Goals**—Operators said that because power settings figure so importantly in maintenance and engine overhaul costs, they desire cruising power to be 50-55% of maximum take-off power for piston engines and between 65% and 70% of maximum power for turbines.

European operators indicated they plan to work up to 2,000-ft. altitudes, with a 7,000-ft. maximum; North American airline representatives said they would require 10,000 ft. to fly over some mountain passes on instruments, with an additional 5,000 to 10,000 ft. required for maneuvering. It was estimated that 80% of the world's copter services would be handled below 5,000 ft.

There was a strong divergence of opinion among operators concerning performance required with one engine inoperative, yet manufacturers emphasized the need for collecting criteria since this would be a fundamental design test.

European operators said they need a minimum rate of climb of 200 fpm. at all altitudes up to 5,000 ft. at the best forward speed with the remaining engine or engines delivering maximum continuous power. U.S. representatives said they desired hovering ability onto and during the critical part of the ascent, with a rate of descent that would ensure freedom from damage. They also asked for a one-engine inoperative cruise speed of 160-170 mph. These conditions, using presently available powerplants, would indicate two possible sizes of copters: one seating 35-40 passengers and the other 45-55.

▶ **Convertible Cabins**—Operators agreed that cabins should be readily convertible to handle passengers or cargo or varying combinations of both. Intercity copter seats would have a 36-in. pitch and 17-in. width, while the metropolitan service models would have bench-type seating similar to street cars.

In either case, it was felt the seats should be constructed of light alloys and reinforced plastics and arm rests and cushions could be dispensed with where possible. Canadian and U.S. government agency representatives indicated this was acceptable.

Although no definite figures were offered on acceptable vibration criteria for passenger comfort, a good target was said to be an amplification of not more than .035 in. at a two-cycle frequency and .003 in. at a 20-cycle frequency.

Other suggestions put before the conference included:

• **Optimum economic weight** of a helicopter using gear transmission should be between 20,000 and 60,000 lb. gross weight, and operators would be well-advised to keep their equipment requirements within this limit to ensure good payloads.

• **Basic flight instruments** would consist of a vertical-speed indicator, artificial horizon and rotor and engine-speed indicators in the upper bank, and altimeter, directional aid and airspeed indicator in the lower. Other aids suggested were backward-and-forward speed indication and revolution indicators for rotors and engines in multi-engine types. There must be sufficient instrumentation to permit 100% regularity in all types of service, the operators said. While it was noted that daytime operations were up to 97% regularity, there was little experience in night flying. In Britain, night schedule regularity had fallen to 77%.

• **Greater instrument flight assistance** was described as a must. Los Angeles Airways spokesmen said they want to achieve "micro-accuracy" allowing them to navigate from street-to-street rather than from area-to-area.

• **Communications requirements** were stressed by metropolitan operators, who said their services required continuous or "saturation" communication. One U.S. operator said the cost of telephone communication to keep post offices informed of mail pickup times already was "fantastic" and that it had been necessary to install a special transmitter and receiver in a New York skyscraper to keep in touch with helicopters.

CAB Kills Investigation of Airline Profits

- **Majority holds that returns from present high fares should be set aside for periods of low earnings.**
- **Board orders a toned-down staff survey and urges carriers to speed up low-fare aircoach expansion.**

Civil Aeronautics Board in a three-to-two decision has killed its formal investigation of airlines' current high profits and fares. CAB instead has ordered a toned-down staff survey (AVIATION WEEK Apr. 27, p. 91), and urged airlines to speed up expansion of low-fare aircoach service.

Harmar Denny, newest Board member, cast the deciding vote, breaking a deadlock. Oswald Ryan and Chan Gurney favored dropping the case; Josh Lee and Joseph Adams opposed.

The Board says recent and current earnings definitely are "excessive when measured by any reasonable standard" but presents these arguments for dropping the investigation:

- **Aircoach** expansion would bring more benefit than an overall fare cut.
- **Incentive** of high profits may promote more experimentation with coach services to intermediate cities and shorthaul routes.
- **Low profits** in the past reduce the 14-year average return to a reasonable level.
- **Business cycle** may cut airline profits later.
- **Staff study** would narrow the issues and make a later investigation more efficient.

▶ **Aircoach Lag**—The Board says the best way to lower fares is an immediate expansion of aircoach service. "We believe that the 25 to 33% reduction in fares made possible by coach service would be of greater public benefit than the relatively modest overall reduction in fares, which might be justified by current earnings."

The majority opinion indicated the airlines must make up for their reprieve from the General Fares Investigation by increasing their efforts in the aircoach field. The Board says carriers still lag on long- and shorthaul aircoach development.

"Coach service between larger intermediate points on the longhaul coach routes has not been added as rapidly as we believe is warranted," CAB says. "On shorter and medium-haul segments, where the bulk of intercity traffic is to be found, there has been an even greater deficiency of coach service."

▶ **New Investigation**—The Board issued a concurrent order for investigation of the present practice of charging first-class rates between some points on a coach flight.

CAB recently suspended an Eastern Air Lines tariff to extend this practice, and Northwest Airlines thereupon withdrew such a tariff on its Billings-Great Falls, Mont., segment. The Board expects other carriers to follow suit, thereby eliminating need for the new investigation.

▶ **Excessive Profits**—CAB says earnings in recent years "must be considered excessive when measured by any reasonable standard applicable to a regulated industry." The Board generally has considered an 8% return "fair and reasonable" for domestic airlines. Average profits since 1950 have run 12-15%.

CAB reasons that high profits are an incentive to low-fare experimentation. "A high overall level of earnings is necessary to provide the economic climate which will induce the industry to move forward to extend coach service to the shorter and possibly less profitable segments."

The Board says it looks to the current profits to offset past losses, stating that "due to the effect of the fluctuations in earnings (1938-52), the returns of the trunklines are much more reasonable. . . ." Its calculations show an average return of 8.3% for the total 1938-52 period of domestic trunk operation under the Civil Aeronautics Act.

▶ **Cycle Approach**—The majority opinion favors a cyclical approach to rate-making. In good times, airlines should keep fares high and set aside excessive profits for future periods of reduced earnings.

"It is, therefore, our belief that both the industry and the public will be better served by a level of fares which reflects the cyclical needs rather than the needs of any particular year," CAB says.

"Should earnings fall markedly in the future, the carriers will be expected to absorb such losses without resort to fare or mail rate adjustments unless it can be demonstrated that such earnings are below the level necessary to provide a fair return over a reasonably extended period which includes the good years as well as the bad."

▶ **Cheaper and Quicker**—Denny, Ryan and Gurney argue that since airlines have canceled their proposed elimination of the roundtrip discount, "there is no legal obligation requiring the Board to continue the formal investigation." A more general investigation would require voluminous testimony on every conceivable fare proposal.

It would be cheaper and quicker, they say, for the CAB staff to study the general situation and come up with firm, narrowly defined recommendations first. Then, if appropriate, the Board could hold formal investigation of the specific recommendations. This is a major argument that induced Denny to reverse his original vote for a formal investigation.

▶ **Lee Dissent**—Lee criticizes CAB's failure to investigate the general passenger fare structure during its 14-year history. He emphasizes that the case was not aimed at cutting fares but at deciding just how and where various fares should be fixed for the greatest mutual airline and public benefit. Therefore, he questions "this reluctance to trust the Board with the power it is supposed to have."

He says CAB permitted last year's dollar fare raise "as an interim measure pending completion of the investigation" now dismissed.

"By dismissing this proceeding and substituting a staff study, the majority is tying the Board's hands so that no matter what facts may be developed by the staff, the Board will be powerless to act without first instituting an entirely new passenger fare investigation."

▶ **Adams' Dissent**—Adams says passenger fares pay almost all airlines' revenue, yet they never have been fully investigated. Mail and freight rates, contributing less than 20% of revenues, have been investigated time and again.

Like Lee, Adams points out that the investigation was only to take a general look at fares and get power to improve them. It was not committed to cutting fares.

He reviews the history of past passenger fare investigations, started but always dropped before conclusion, and concludes that the airlines have "outmaneuvered" the Board. Losses of the 1946-48 period were not due to CAB-imposed fares but to reductions and other actions by the airlines themselves, he says. —LM

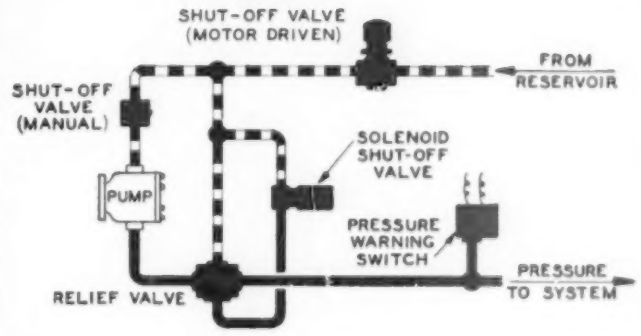
CUSTOM-BUILT

Vickers
Model AA-40510
Pump Control Valve.
(18 gpm)

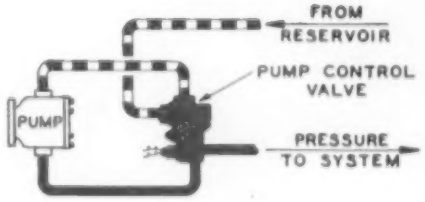
VICKERS VALVE...

- ☆ SIMPLIFIES HYDRAULIC SYSTEM
- ☆ REDUCES FIRST COST
- ☆ SAVES WEIGHT
- ☆ REDUCES MAINTENANCE COST

BEFORE



AFTER



Special Vickers Pump Control Valve replaces five separate units.

This special 5-in-1 valve was developed for use where it is desirable to individually control each of several pumps. It will automatically unload the pump delivery at a low pressure into the suction side when the oil temperature has reached a predetermined maximum. The design includes manual unloading of the pump. Maximum system pressure is limited by a built-in relief valve. A pressure-actuated electric switch is provided for use in a signal system to flag system pressure changes. The manual pump shut-off control also serves as a firewall shut-off device.

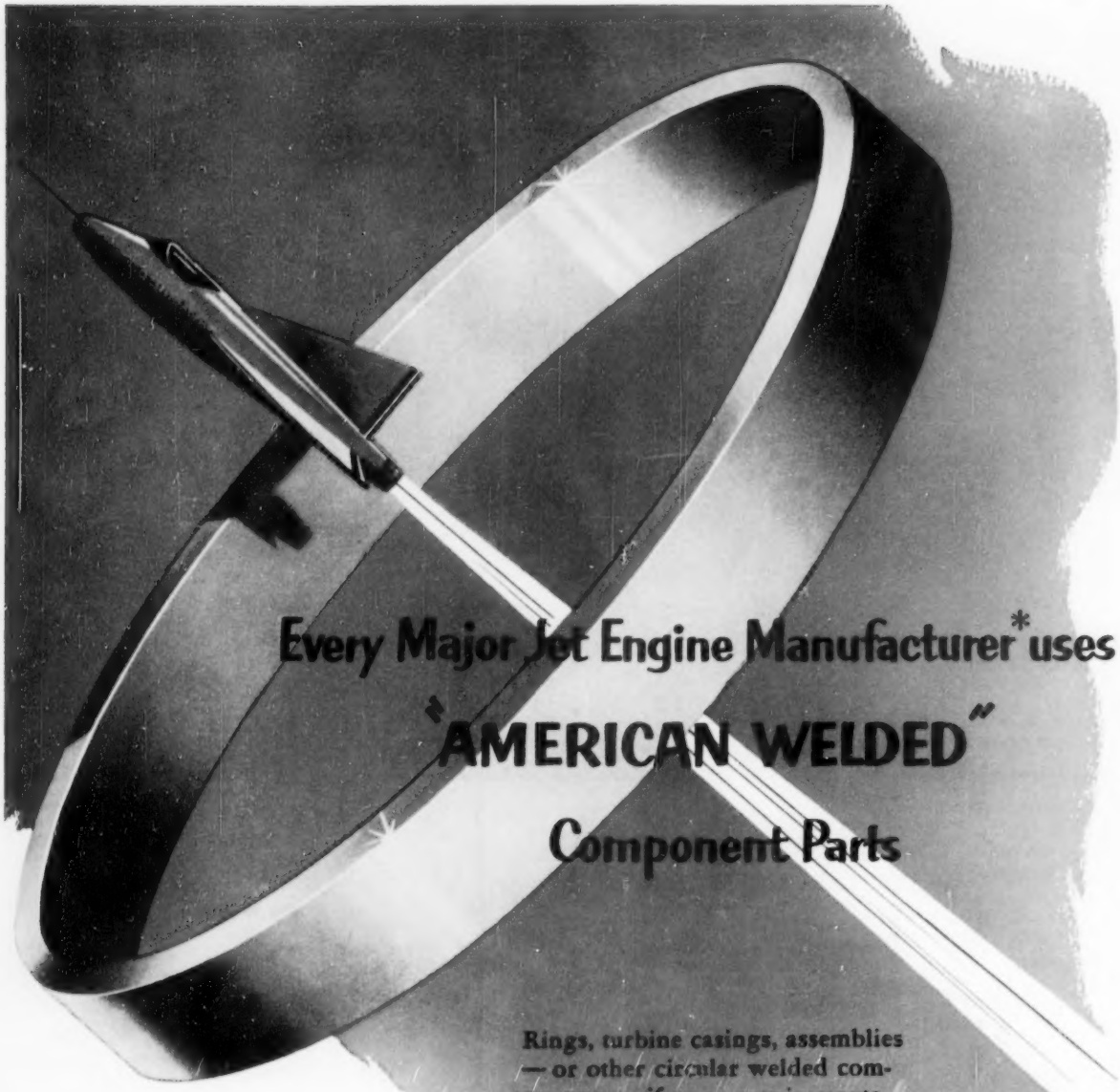
As used on one four-engine airplane, this accessory reduced the number of separate hydraulic units from 14 to 4 and eliminated four electrical switches. It utilizes many standard internal parts. Replacement of multiple accessories by the single valve reduced procurement costs by about 66%; this does not include savings due to the simplified piping. The weight saving was also significant. For further information, write for new Bulletin A5230.

Vickers designs and manufactures a great variety of special hydraulic controls for aircraft. Call on us with your problem.

VICKERS Incorporated • 1462 OAKMAN BLVD., DETROIT 32, MICHIGAN

6331

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921



Every Major Jet Engine Manufacturer* uses "AMERICAN WELDED" Component Parts

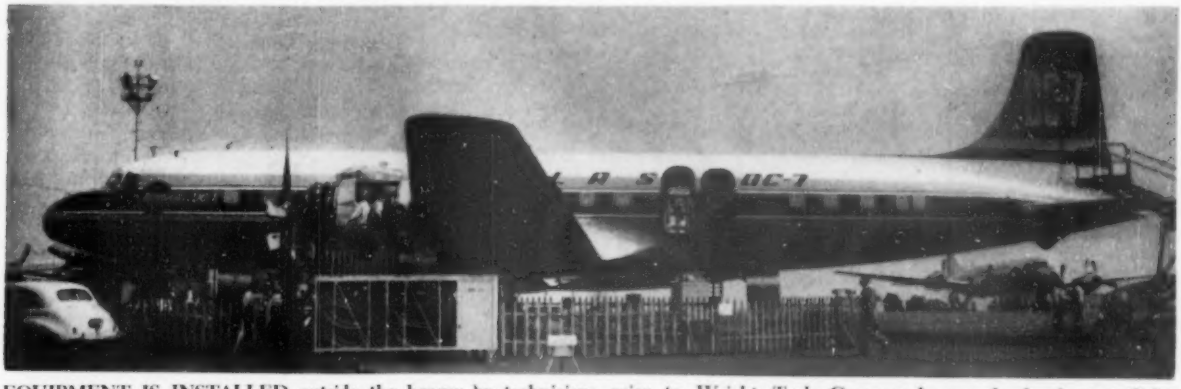
Rings, turbine casings, assemblies — or other circular welded components — if your requirements call for either fusion or resistance welding of ferrous or non-ferrous metals, our Product Development Division can help you. American Welding provides designing, engineering, metallurgical and machining facilities. Give our local representative a call — or write direct — we will be glad to study your problem.

*United States

THE AMERICAN WELDING & MANUFACTURING COMPANY

420 DIETZ ROAD • WARREN, OHIO

FIRST DOUGLAS DC-7 takes off on maiden flight at Santa Monica May 18, after the new transport's recent rollout (below).



EQUIPMENT IS INSTALLED outside the hangar by technicians prior to Wright Turbo-Compound-powered plane's test flight.

Douglas DC-7 Makes Maiden Test Flight

Santa Monica, Calif.—Douglas Aircraft's DC-7 made its maiden flight here last week with chief test pilot John F. Martin at the controls.

After a short, nose-high takeoff run, Martin circled the pattern, made a swift pass across the runway at 500 ft. and climbed out steeply for the 2-hr. 12-min. first flight that opened an accelerated test program.

"I have to keep pulling back the throttles. She wants to go like a striped ape," he reported by radio.

▶ **Quiet Engines**—Most observers were surprised by the low noise level of the four big Turbo Compound engines powering the latest Douglas commercial transport.

Noise level was less than the DC-6 series, despite the increase in power. This may be due to the fact that all DC-6 exhaust stacks are ported away from the cabin—toward outside observers—whereas the Turbo Compound exhausts are evenly distributed.

Martin reported no overbalance on elevators or ailerons—a possible problem that apparently had troubled Douglas engineers. He said the aircraft handled "very good."

Co-pilot on the first flight was Bert A. Foulds, flight engineer was Duncan Hall.

▶ **Differences**—As it lifted from the runway, only difference between the DC-7 and its DC-6B predecessor apparent to a casual observer was a paint job identifying it in giant letters as a Douglas DC-7.

But a closer examination revealed fundamental differences that make a new aircraft of the latest Douglas entry in the commercial field.

"We have not changed the basic design," said assistant project engineer Thayle F. Taylor, "but the change from the DC-6B to the DC-7 is as great as from the DC-4 to the DC-6."

Major changes include:

• **Installation** of Wright 3350 Turbo Compound engines with higher speed from lower weight-to-power ratio.

• **Extensive use** of titanium in engine nacelles.

• **Use of main** landing gear as speed brake.

• **New anti-icing** carburetor airscoop.

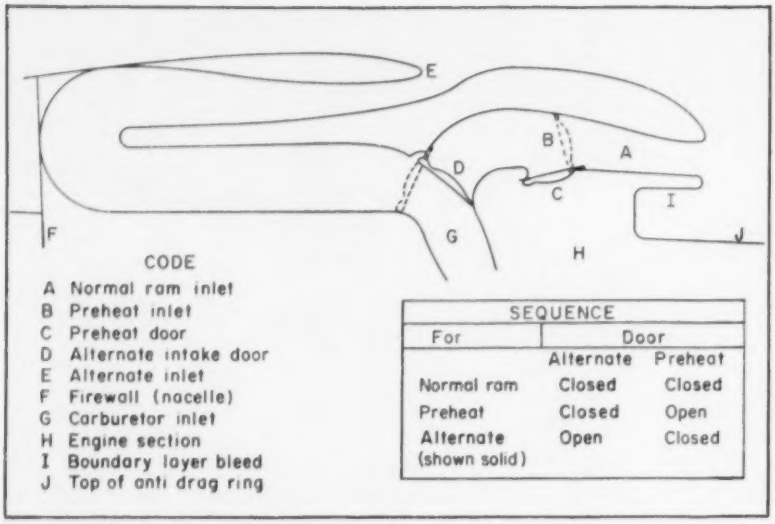
• **Accelerated** flight test program.

▶ **Last Piston Airliner**—Douglas engineers were given just one goal in designing the new aircraft: make it fly faster than any other commercial piston transport in service. This will be the last Douglas entry in the piston transport field.

E. F. Burton, chief engineer of the Douglas Santa Monica Division, described the DC-7 as the "fastest and most powerful" transport ever designed by his company for commercial operation.

"This is our blue-ribbon ship for the deluxe trade," said project engineer J. R. McGowan.

Douglas expects the DC-7 to cut an hour off transcontinental schedules with a cruising speed of 365 mph., which the company believes will make it the fast-



CARBURETOR AIRSCOOP schematic. This layout is designed to prevent ice-forming moisture particles entering the new plane's air induction system.

est airliner produced in the U.S. until the arrival of jet transports.

It will cost more than $1.5 million against slightly more than $1 million for the DC-6B.

▶ **50 Mph. Faster**—Turbo Compound engines will give the DC-7 a maximum speed of 410 mph., compared with 360 mph. for the DC-6B. Wing span of 117 ft. 6 in. and height of 28 ft. 8 in. is the same for both transports. But the new aircraft is 3 ft. 4 in. longer.

Despite increased thrust of the four Wright 3350 engines, the tail is the same size. Moving it back by means of the increased length has balanced the thrust and speed increase aerodynamically, and the CG limits remain approximately the same.

Maximum gross takeoff weight is listed at 122,200 lb., against 107,000 for the 6B.

Because the increased length is not apparent, fastest way to tell the difference between a DC-7 and a DC-6B on the ground is by the four-blade 13½-ft.-diameter Hamilton Standard 6921-A-8 propellers as contrasted with the three-blade Hamilton Standards on the DC-6Bs. Oil coolers and engine airscoops also are more prominent on the new aircraft.

▶ **Nose Radar**—Pitot impact tubes have been relocated to make provision for nose radar, which Douglas expects to be standard airline equipment in the future. Structural provisions also have been made for such radar.

The pitot tube shift from the nose to high on each side gives several other advantages:

• **Tubes** are in view of the pilot, who now can check visually to see that covers have been removed.

• **Collision** with a bird will not knock out both pitot tubes at once.

• **New locations** may result in more accurate readings at high angle of attack, as when near a stall, according to Douglas engineers.

Plastic ram's horn antenna for VHF is mounted atop the fuselage, replacing the straight 24-in. mast on the bottom of the DC-6B. Thus nose gear no longer is able to shield the antenna from the tower, as occasionally happens with the 6B.

▶ **Increased Stability**—The 2-deg. nacelle incidence on the DC-6 series has been eliminated on the DC-7 to give more stability and ease propeller loads. Nacelle structure is strengthened greatly due to large increase in thrust and torque of the engines, which boosted bending moment 37%, shear 26%.

Outboard nacelles are the same length as on the 6B, but the engine section is 11 in. longer. The inboard nacelle is 4 in. longer, in addition to the 11 in. added by the Wright engine. The extra length of the inboard nacelles provides for larger tires, if needed, in the future. Present tires are 15.50x20 20-ply rating.

DC-7 brakes and gear are larger. Goodyear triple-disc brakes are undergoing dynamometer tests. Provision also is made for Hytrol anti-skid brakes. Skid warning systems will be installed in the first two DC-7s used in the testing program.

▶ **Escape Hatch**—Belly cargo door on the new aircraft is larger and is centered.

To meet a future Civil Aeronautics Administration requirement, there is a new floor-length 24-in. x 52-in. escape exit in the aft end of the aircraft opening out of the lounge. Elimination of one seat in the lounge was necessary to make room for this door.

Although there is no change in the size of the tail, the rudder tab is about 25 in. longer and the tab control is at the bottom instead of in the center as on the DC-6B. This is expected to eliminate icing problems encountered on the older transport.

DC-7 has basically the same electrical, hydraulic and control systems as the 6B.

Interior design will depend, as usual, on individual airline preference. One version will use the additional length for cargo space, another for increased passenger seating.

▶ **Bandaid Soundproofing**—Because increase in engine power means more noise, 500 lb. more soundproofing material is required in the DC-7. In the section near the propellers, number of frames in the fuselage has been doubled to decrease vibration.

Acoustimat soundproofing, consisting of layers of aluminum foil and tape, has been used in place of mica. Project engineer McGowen said that while mica appeared just as efficient and about the same weight, installation of the Acoustimat soundproofing was much easier—"much like putting a Bandaid on a kid," as he termed it.

Window size remains the same; but to cut down noise, an additional plexiglas pane, free-floating in rubber, has been added, resulting in a triple pane.

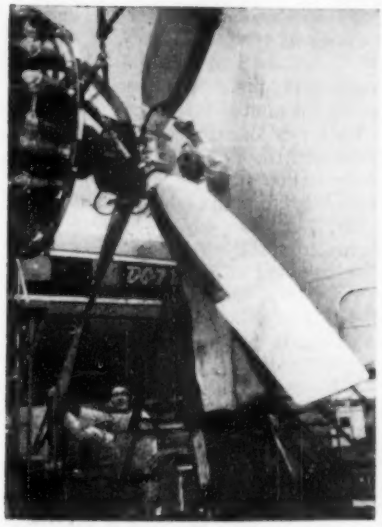
Another innovation for passenger comfort is the Douglas-designed Freon refrigeration system. In addition to in-flight cooling, the Freon system will operate from a ground electrical supply when the engines are not turning over. Douglas engineers said this will prevent the aircraft from becoming uncomfortably hot while standing on the ground for long periods prior to passenger boarding.

▶ **Speed Brake**—Pilots will find few differences between DC-6B and DC-7 cockpits. This is deliberate, because airlines plan to interchange crews. McGowen said this is one reason Douglas resisted efforts to require the installation of a flight engineer's station in the DC-7.

Main landing gear on the DC-7 may be used by pilots as a speed brake. Wheels and other components have been strengthened so they may be ex-

DC-7 at a Glance

Maximum speed	410 mph.
Cruising speed	365 mph.
Wingspan	117 ft., 6 in.
Length	108 ft., 11 in.
Height	28 ft., 8 in.
Passenger capacity	46, 64, or 95
Crew	5 or 6
Maximum gross takeoff weight	122,200 lb.
Fuel capacity	5,512 gal.
Absolute range	4,450 mi.
Takeoff horsepower	3,250 each engine
Engines	Wright 3350 Turbo Compound
Propellers	Hamilton Standard 6921A-8 four blade, 13½-ft. diameter



FOUR-BLADE Hamilton Standard prop, one blade in reverse position, goes on DC-7.

tended at 300 mph. indicated airspeed (about 410 mph. at 20,000 ft.).

The drag of the aircraft almost is doubled by extending the main gear, according to McGowen. A pinchgrip handle trips the uplatch, allowing the gear to fall free without hydraulic pressure. Extension of the nose wheel or retraction of the main gear is accomplished in the normal manner by use of the standard landing gear handle, which overrides the speed brake control.

Douglas engineers expect this to aid in turbulence and to allow steep descent at destination. Douglas also is trying to increase the speed of retraction to 7 sec. Gear retraction on the DC-6B requires 8½ sec.-9 sec.

► **Beans From Chaff De-Icing**—The new carburetor airscoop is designed to give the pilot a "threshold" device for use when on the edge of icing conditions. It prevents ice-inducing moisture particles from entering the carburetor by diverting aerodynamic flow to an alternate air intake in what McGowen calls a "beans from chaff" principle of centrifugal separation. Ram recovery characteristics are said to be good. During severe icing, the pilot can switch to heat, but he avoids power or altitude loss under marginal icing.

Among the minor cockpit changes pilots will notice are these:

• **Kollsman Series 865** Mach airspeed indicator has been installed. Unlike a Mach meter, this provides a separate bellows and red pointer for Mach indication in addition to standard pointers for airspeed. Thus, pilot at a glance can determine indicated airspeed and Mach without involved computation.

• **New trim tab** has been installed on the left-hand aileron. This is cable-controlled to a cockpit wheel. Pilots have complained that while the geared tab

Great Airlines
from Little Airlines grow

and become GREAT assets to the commercial and military might of our Nation!

EASTERN AIR LINES, INC. of New York City is one of the finest examples of such dynamic development. For Eastern began back in 1928 when their first parent company was formed, backed only by private capital and the stern determination to render a vital new service to the Nation and its citizenry.

It was then that Harold F. Pitcairn, an aircraft manufacturer, successfully bid to carry the mail from New Brunswick, New Jersey, to Atlanta. Pitcairn Aviation Company began this service the following year with 5 Pitcairn PA-5 Mailwings, and by 1930 when the name was changed to Eastern Air Transport, the company was operating 6 Curtiss Condors, 14 Kingbirds, a Ford tri-motor and 2 Folker tri-motors. In 1931 New York Airways was added; in 1933 Ludington Airlines; and in 1936 Wedell-Williams Transport Corporation. In 1938 famous Captain Eddie Rickenbacker and his associates bought Eastern Air Transport and formed Eastern Air Lines, Inc., operating a modernized fleet including: 2 Stinson Reliants, 10 Douglas DC-2's and 10 Douglas DC-3's. During that year Eastern carried an unprecedented 162,-246 revenue passengers and rolled up the then impressive record of more than 8 million revenue miles.

Today, fifty years after the famous Wright Brothers' first flight at Kitty Hawk, North Carolina, Eastern's Great Silver Fleet includes more than 34 Lockheed Constellations, 60 Martin Silver Falcons, and 11 Douglas DC-4's. And route mileage has grown from a humble 1411 miles to the present 12,746 miles.

Thus on the golden anniversary of powered flight, NORTH AMERICAN AIRLINES, an independent carrier pioneering air coach in today's tempo, congratulates Eastern Air Lines and Captain Eddie Rickenbacker and his associates, for its contribution to the development and growth of the Nation's air transport industry under the American free enterprise system.

(Second in a series — FOLLOWING THE TRAIL OF THE PIONEERS)

NORTH AMERICAN AIRLINES

First in Air Coach

on the DC-6B gives the desired rate of roll, it is difficult to trim. Addition of the cable-controlled tab is expected to take care of this.

• **Turning angle** of the new aircraft will be 2 deg. greater, although wheel base remains the same. Nose steering power has been increased 60%.

• **Engines** will have the mechanical blower shift similar to the DC-4. Blower shift in the DC-6 series is electrical.

• **Thickness** of the inner panel of the cockpit windshield has been increased to provide more impact strength for protection against birds at higher speeds of the DC-7.

▶ **Titanium Skins**—Titanium was used extensively in the nacelles, with a weight saving of more than 200 lb. Douglas said this is the first time titanium has been used in any commercial aircraft in other than token quantities.

"Approximately 90% of the primary structural nacelle skins aft of the firewall, as well as the firewall itself, are of this material," McGowen said.

Assistant project engineer Taylor pointed out the use of titanium in the DC-7 is part of a testing program designed to develop and explore uses for the new metal. Its use in the engine nacelles means a thorough test for vibration, heat, air flow and corrosion.

▶ **DC-7 Tests**—Flight testing of the DC-7 will be unusual for a Douglas commercial transport. First three DC-7s off the line will be used in the accelerated flight test program, the fourth for ground tests.

First two aircraft will be completely instrumented, the third will have interior airline fittings. With complete instrumentation available from the first flight, Douglas plans to run 6-7 hr. flights to speed up testing. CG shifts may be made in flight by using water tanks, pumps and dump chutes. Longer flights will allow engineers to check calculations in flight, request further tests immediately.

"We expect this to be the most efficient testing we've ever done," said McGowen. Even prior to the maiden flight, instruments were in service checking engine runups. Elapsed time of the test program is expected to be 50-70% less usual with the same flight time.

▶ **Year-End Deliveries**—Douglas expects CAA certification by year's end, plans 18 deliveries by that time. Twenty-five DC-7s have been ordered by American Airlines, 25 by United, four by Delta-Chicago & Southern and four by National for an announced total of 58. At present, more DC-6Bs are on order than DC-7s.

DC-7s are being turned out on the same assembly line with 6Bs, 6As and two military variants of the A. **W.J.C.**

AIRCRAFT
TUBING
From the time Henry Berliner made the first successful American Helicopter in 1922 until the present day whirling giants, steel tubing has played a major part in the construction of these machines, offering light weight, strength and the dependability of steel.
Call, write or wire Service Steel for details on your aircraft tubing requirements.
NAVY
63
SERVICE STEEL Div.
VAN PELT CORPORATION
1435 FRANKLIN ST.
DETROIT 7, MICH.
756 Hertel Ave.
Buffalo 7, N. Y
4940 N. Western Ave.
Chicago 25, Ill.
3410 Comfort St.
Cincinnati 23, O
2442 Hunter St.
Los Angeles 21, Calif.

Final Mail Rate Puts Northeast Out of Red

Northeast Airlines is out of the red as the result of a Civil Aeronautics Board show-cause order proposing a final mail rate granting $542,242 more subsidy per year than the carrier got on its temporary pay.

Northeast operating loss last year was $292,901. Sale of equipment yielded $262,433 net non-operating income and an income tax credit totaled $2,548, leaving a net loss of $27,920.

Under the new final mail rate, the company should earn $365,000 a year after taxes if business goes as forecast. That is an 8% return on investment, as CAB figures it.

▶ **Mail Rate**—Final rates set by the Board are estimated to yield $1,734,679 a year from last October forward and a total of $8,599,861 for the five and a half years from May 1, 1947, to Sept. 30, 1952.

Future rate is 29 cents per revenue plane-mile flown, compared with the temporary rate of 20 cents. For the back period, final rate is increased from 36.27 cents to 37.87 cents.

The new mail rate for Northeast is 92% subsidy, according to CAB. With mail making up 20% of revenue, the carrier is currently the most subsidized trunk airline.

Cuba Ups Landing Tax

(McGraw-Hill World News)

Havana—A 400% increase in the Cuban federal landing tax charged air tourists has aroused bitter protests from local business and civic organizations. The charge, which went into effect May 1, is $2.50 per person, compared with the previous toll of 50 cents.

Income from the new tax will be approximately $400,000 annually and will be used to finance promotional activities of the recently reorganized Cuban Tourist Bureau, formerly an autonomous agency but under the wing of the Communications Ministry at the present time.

CAB ORDERS

Southwest Airways authorized May 12 to suspend service temporarily at Coalinga, Oroville and Vallejo-Napa, Calif., provided it serves Sacramento only on flights starting or ending at Reading or a point north of there. E7371.

Trans-Texas Airways authorized May 12 to suspend service temporarily at McCamey-Sheffield, Tex. E7370.

Cordova Airlines authorized May 12 to suspend service at Whittier, Alaska, until adequate seaplane facilities become available. E7369.

United Air Lines 54-seat DC-4 aircoach tariff suspension proposal by Eastern Air Lines dismissed May 11 because of CAB-United compromise in which UAL promises to increase seating to 64 seats as planes come through overhaul this year. E7367. Enforcement proceeding for violation of the 64-seat tariff dismissed May 8. E7365.

Provincetown-Boston Airline interline agreements with American and other carriers approved May 11. E7366.

Ozark Airlines denied on May 6 an exemption requested to fly Peoria-Chicago, pending hearing of new application for new Kansas City-Chicago route. E7364.

Wien Alaska Airlines temporary mail rate fixed May 6 at rate proposed in April 23 show-cause order. E7363.

Mackey Air Transport authorized May 6 to change its name to "Mackey Air Lines." E7362.

Central Airlines request for exemption to serve Bonham, Tex., withdrawn by carrier and dismissed May 7. E7361.

Amendment of investigation order on renewal of regulation covering authorization of freight forwarders making clear that scope of case relates to all matters concerning their services to air carriers. E7357.

Fred B. Lee, new Civil Aeronautics Administrator, was designated May 6 as official complainant in all CAB proceedings now pending. S565.

Propeller Service Corp. repair station certificate revoked May 5 for altering, welding and re-machining counterweights in pitch-change mechanism of Hamilton Standard propellers sold to de Havilland for observation planes in violation of approved practice and provisions of CAA Manual No. 18. S564.

Piedmont Aviation authorized May 5 to omit service at Lexington, Ky., on one roundtrip daily on Route 87, provided it gets at least two trips a day on another route. E7360.

Alaska Airlines and Wien Alaska denied May 5 request that records in Alaska route modification case be re-opened. Oral argument of the case was held Nov. 18, 19, 1952, and cases are submitted for decision. E7359, 7358.

CAB CALENDAR

Prehearing conference:

States-Alaska route and merger case. Examiner, Francis Brown. May 25.

Lake Central Airlines renewal show-cause order. Joseph Fitzmaurice. May 26.

National Airlines Miami-Philadelphia coach fare investigation. F. Merrit Ruhlen. June 19.

Examiner hearing:

Trans-Atlantic cargo route case. Herbert Bryan. In progress.

Large irregular carrier policy investigation. Richard Walsh and Ralph Wiser. In progress at Miami Beach.

Tariff liability investigation. James Kieth. June 1.

Trans-Pacific Airlines certificate renewal case. Thomas Wrenn. June 15.

North American Airlines enforcement 6000. William Cusick. June 23.

West Coast-Hawaii route Case 5589. Thomas Wrenn. July 6.

States-Alaska route and merger. Francis Brown. Indefinitely postponed. No oral arguments scheduled.

SABRE JET'S EDGE CUTS DEEPER

... with PASTUSHIN TANKS

Pastushin-made jettisonable fuel tanks give North American Aviation's F-86 greater fuel capacity . . . give it that fighting edge in Korean combat.

AIRCRAFT FUEL TANKS • SEATS • LANDING FLAPS
AILERONS • TAIL SURFACES • BOMB BAY DOORS

PASTUSHIN AVIATION CORPORATION

5651 West Century Boulevard • Los Angeles 45, California

LOS ANGELES INTERNATIONAL AIRPORT, LOS ANGELES, CALIFORNIA

SHORTLINES

► **British Commonwealth Pacific Airlines,** associate of BOAC, has celebrated the fifth anniversary of its first trans-Pacific service. Commonwealth Pacific operates DC-6s, carrying 48 day or 37 overnight passengers on its "Southern Cross" route from Australia/New Zealand to Vancouver, B. C. The airline has flown 259,068,275 passenger-miles, 2,130,454 cargo ton-miles and 1,640,366 mail ton-miles.

► **British European Airways** has begun tri-weekly London-Naples-Malta service.

► **British Ministry of Civil Aviation** has ruled civil aircraft may not fly under 11,000 feet within five nautical miles of Buckingham Palace between 7 a.m. and 7 p.m. Coronation Day June 2.

► **British Overseas Airways Corp.** will operate 58 roundtrip tourist coach Constellation flights between New York-Montreal-London, this month. Last month, BOAC flew 35 Atlantic roundtrips. . . . Has been granted right to operate scheduled service until Mar. 31, 1960, on its London-Geneva-Duesseldorf or Frankfurt-Rome-Nicosia-Beirut routes.

► **Canadian Pacific Airlines** has started "independent action" to offer emigrant fares on DC-6B service from Hong Kong and Japan to the U. S. and Brazil. Tokyo-Sao Paulo emigrant fare will be $250 less than regular $1,210. CAB recently disapproved a similar IATA emigrant fare unless it was arranged by charter.

► **Continental Air Lines** and United ask speedy CAB approval of a one-plane DC-6 interchange Seattle, Portland, Denver, Wichita, Tulsa. . . . Continental continues opposing a proposed Eastern-Braniff-TWA inter-change proposal Houston-West Coast, "duplicating" the Continental-American interchange.

► **International Civil Aviation Organization** reports the United Kingdom as the 19th state to sign the Rome convention of 1952 on limited liability of airlines for personal and property damage in foreign territory. USA refuses signature.

► **K.L.M. Royal Dutch Airlines** has refused a permit to land aircraft at Mala-Mala Airport in South Africa because it has been notified that lionesses with newborn cubs are making homes on the field's runway.

► **National Air Taxi Service** doubled its membership during 1952, now has 93 certified operators in 32 states and Alaska, compared with 47 members at the beginning of 1952. NATS members flew an estimated 4½ million passenger-miles for an estimated revenue of $650,000, and maintained about 300 aircraft for air taxi service, completing an estimated 9,000 roundtrips.

► **Northwest Airlines** is changing its trade name to Northwest Orient Airlines. . . . Corporate name will remain unchanged. . . . Company's Super Constellations will be delivered with 47-seat luxury arrangement, but are designed for conversion to 99-seat coach and one version would seat 112 passengers, according to Henry Dreyfuss, interior designer of the plane. . . . Airline had its biggest day in company history May 4 when domestic passenger revenue totaled $136,414.

► **Ozark Airlines** has CAB permission to serve Milwaukee from St. Louis. . . . Company also has asked CAB to revoke the certificate of Lake Central Airlines and grant the routes to Ozark, or approve Ozark acquisition of Lake Central.

► **Pan American World Airways** reports its coach service started to Hawaiian Islands last December has almost doubled traffic to the islands. Company uses 81-seat Stratocruisers for coach, 60-seat Stratocruiser for first-class.

► **Pioneer Air Lines** last week moved operations from Meacham Field in Ft. Worth to Amon Carter Memorial Airport.

► **Seaboard & Western Airlines** has flown 7,801,504 freight ton-miles in commercial and military operations over the Atlantic and Pacific in the first quarter of this year, an increase of 68% over the first quarter of 1952. . . . Completed six years of trans-Atlantic operations on its 1,931st crossing recently.

► **Slick Airways'** new DC-6A air freight service is releasing C-46s for more flights to serve intermediate cities and to feed into DC-6A transcontinental schedules.

► **Southern Airways** operated during April with a load factor of 34.73%, highest in company's history.

► **United Air Lines** is merchandising semi-private group accommodations in the forward compartment of its DC-6B Mainliners. Eight seats, two-facing-two on either side of the aisle, are provided. . . . Flew 212,372,000 revenue passenger miles, in April, 13% increase above April 1952.

AVIATION CALENDAR

May 26—Second historical meeting, Institute of the Aeronautical Sciences, IAS Building, New York. Guest speaker: Clarence D. Chamberlin.

May 28-29—Aeronautics conference sponsored by the Michigan Department of Aeronautics, Kellogg Center, Michigan State College, East Lansing.

May 31—Fifth annual Wright Memorial Glider Meet, South Dayton (Ohio) Airport.

June 5-July 5—20th International Aviation Display, sponsored by the Union Syndicale des Industries Aeronautiques, Bourget Airport, Paris.

June 9-11—Second International Aviation Trade Show, Hotel Statler, New York.

June 11-13—Fifth annual All-Women International Air Race, Welland, Ont., to New Smyrna Beach, Fla., sponsored by Ninety-Nines, Inc.

June 16—Seventh session of the assembly of the International Civil Aviation Organization, Brighton, England. Session is expected to last three to four weeks.

June 16-19—Spring technical meeting of the American Welding Society, Shamrock Hotel, Houston.

June 17-19—Mid-year meeting of Aviation Distributors and Manufacturers Assn., Chateau Lake Louise, Alberta, Canada.

June 19-21—Pennsylvania State Wing convention of the Air Force Assn., Hotel Roosevelt, Pittsburgh.

June 22-July 3—Special summer program presenting a formalized theory for analysis and synthesis of feedback control systems, Massachusetts Institute of Technology, Cambridge.

June 29-July 2—Semi-annual meeting, American Society of Mechanical Engineers, Hotel Statler, Los Angeles.

July 1-3—Annual meeting of University Aviation Assn., National College of Education, Evanston, Ill.

July 3-7—Seventh All-Women Transcontinental Air Race from Lawrence, Mass., to Long Beach, Calif.

July 4-5—Dedication of Coles County Airport, Mattoon, Ill.

July 6-17—Special summer program in advanced strength of materials, MIT.

July 9-12—Sixth International Aviation Exposition, Wayne County Airport, Detroit.

July 15-16—IAS Annual Summer Meeting, Honors Dinner, IAS Building, Los Angeles, Calif.

Aug. 2—Amarillo, Tex., Jaycee Air Fair, observance of 50th Anniversary of Powered Flight, Tradewind Airport.

Aug. 2-8—Fourth annual congress, International Astronautical Federation, Zurich, Switzerland.

Aug. 19-21—Western Electronic Show and Convention, Civic Auditorium, San Francisco.

Aug. 25—Opening of the ninth legal committee meeting, International Civil Aviation Organization, Rio de Janeiro.

Sept. 5-7—National Aircraft Show and 50th anniversary of powered flight, Dayton (Ohio) Municipal Airport.

Sept. 7-17—Fourth International Aeronautical Conference, joint meeting of RAeS and IAS, London.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—MAY 25, 1953

ADAMS-RITE MFG. CO. 50
Agency—The Shaw Company

ADEL DIV., GENERAL METALS CORP. 86
Agency—The McCarty Company

AEROQUIP CORPORATION 39
Agency—Hopcraft-Keller, Inc.

AIRBORNE ACCESSORIES CORP. 8
Agency—Gray & Rogers Adv.

AIRCRAFT RADIO CORP. 8
Agency—Burke Dowling Adams, Inc.

ALUMINUM CO. OF AMERICA 76
Agency—Fuller & Smith & Ross, Inc.

AMERICAN WELDING & MFG. CO. 98
Agency—The Bayless-Kerr Co.

ARMA CORPORATION 21
Agency—Doyle, Kitchen & McCormick, Inc.

AUSTENAL LABORATORIES, INC. 48
Agency—Frank C. Nahser, Inc.

BENDIX PRODUCTS DIV. BENDIX AVIATION CORP. ..... Third Cover
Agency—MacManus, John & Adams, Inc.

BOEING AIRPLANE CO. 68
Agency—N. W. Ayer & Sons, Inc.

CAMLOC FASTENER CORPORATION 33

CITIES SERVICE OIL CO. 66
Agency—Ellington & Co., Inc.

CONTROL PRODUCTS, INC. 79
Agency—George Homer Martin Associates

DOW CORNING CO. 73
Agency—Don Wagnitz Adv.

EASTMAN KODAK CO. 49
Agency—J. Walter Thompson Co.

EBERHARD FABER PENCIL CO. 60
Agency—Hicks & Greist, Inc.

EDO CORP. 72
Agency—Davis-Parsons, Inc.

ELASTIC STOP NUT CORP. OF AMERICA 34
Agency—G. M. Basford Co.

FENNEL INSTRUMENT COMPANY 62
Agency—Posner-Zabin Advertising

FINE ORGANICS, INC. 23
Agency—Kermin-Thall

FLYING TIGER LINE, INC. 30
Agency—Hixson & Jorgensen Adv., Inc.

FOOTE BROS. GEAR & MACHINE CORP. ..... Fourth Cover
Agency—Buchen Co., The

GARRETT CORP., THE, AIRESEARCH MFG. CO. 5
Agency—J. Walter Thompson Co.

GENERAL ELECTRIC CO. 31
Agency—G. M. Basford Co.

GOODYEAR TIRE & RUBBER CO. ..... Front Cover
Agency—Kudner Agency, Inc.

HAMILTON STANDARD PROPELLER DIV. UNITED AIRCRAFT CORP. 11
Agency—Lennen & Newell, Inc.

HARTMAN ELECTRICAL MFG. CO. 57
Agency—Palm & Patterson, Inc.

HAYDON CO., A. W. 77
Agency—Cory Snow, Inc.

HYDRO AIRE, INC. 22
Agency—John H. Riordan Co.

INTERCONTINENTAL MFG. CO., INC. 71
Agency—Interamerican Adv. Agency, Inc.

INTERNATIONAL AERRADIO LTD. 86

KARL-DOUGLAS ASSOCIATES 78
Agency—Clyde D. Graham Adv.

KRENGEL MANUFACTURING COMPANY 27
Agency—Will Burgess & Company

LAPOINTE MACHINE TOOL CO., THE 72
Agency—Wells Advertising Agency

LEAR, INC. 87
Agency—Buchanan & Co., Inc.

LIQUIDOMETER CORPORATION 44

LYCOMING DIVISIONS-AVCO MANUFACTURING CORP. 29
Agency—Benton & Bowles, Inc.

MARMAN PRODUCTS CO., INC. 52
Agency—West-Marquis, Inc.

MARYLAND ELECTRONIC MFG. CO. 69
Agency—Geare-Marston, Inc.

MELETRON CORP. 24
Agency—Welsh-Hollander Adv.

MILLER ELECTRIC MFG. CO. 79
Agency—R. C. Breth, Inc.

MILO RADIO & ELECTRONICS CORP. 79
Agency—Krate-Basch Associates, Inc.

MINNESOTA MINING & MFG. CO. 65
Agency—MacManus, John & Adams, Inc.

NEW DEPARTURE DIV. G. M. C. 3
Agency—D. P. Brother & Co., Inc.

NORTH AMERICAN AIRLINES 101
Agency—The Killingsworth Co., Inc.

NORTH AMERICAN AVIATION CO. 105
Agency—Batten, Barton, Durstine & Osborn, Inc.

NUTT-SHEL COMPANY 59
Agency—Welsh-Hollander Adv.

PACIFIC DIV. OF BENDIX AVIATION CORP. 70
Agency—The Shaw Company

PACIFIC SCIENTIFIC COMPANY 74
Agency—Darwin H. Clark Co.

PASTUSHIN AVIATION CORP. 103
Agency—Lynn-Western, Inc.

PESCO PRODUCTS CO. 63
Agency—Fuller & Smith & Ross, Inc.

PITTSBURGH PLATE GLASS CO. (FIBER GLASS DIV.) 83
Agency—Ketchum, MacLeod & Grove, Inc.

PROTO TOOLS 4
Agency—Willard G. Gregory & Co.

PUROLATOR PRODUCTS, INCORPORATED 51
Agency—J. Walter Thompson Co.

RADIO CORP. OF AMERICA 32
Agency—J. Walter Thompson Co.

REMINGTON RAND, INC. 25
Agency—Leeford Adv. Agency, Inc.

REVERE CORP. OF AMERICA 28
Agency—Troland, Inc.

ROBBINS AND ASSOCIATES 82
Agency—The Essig Company

ROHR AIRCRAFT CORP. 12
Agency—Barnes Chase Co.

RYAN AERONAUTICAL CORP. 26
Agency—Batten, Barton, Durstine & Osborn, Inc.

SEARCHLIGHT SECTION 88, 89, 90, 91, 92, 93, 94, 95

SERVICE STEEL DIV. VAN PELT CORP. 102
Agency—Claude E. Whipple Adv.

SIMMONDS AEROCESSORIES, INC. 61
Agency—Burke Dowling Adams, Inc.

SINCLAIR REFINING CO. 54, 55
Agency—Morey, Humm & Johnstone, Inc.

SMITH MORRIS CO. 41

SNAP-ON-TOOLS CORP. 85
Agency—The Cramer-Krasselt Co.

SPERRY GYROSCOPE CO. 6
Agency—Charles Dallas Reach Co., Inc.

SPERRY GYROSCOPE CO. 86
Agency—The Equity Adv. Agency

STEPHEN-DOUGLAS CO., THE 105

SWEDLOW PLASTICS CO. ..... Second Cover
Agency—Francis D. Gonda Co.

THOMPSON CO., THE H. I. 47
Agency—The Abbott Kimball Co. of Calif.

TIMKEN ROLLER BEARING CO. 43
Agency—Batten, Barton, Durstine & Osborn, Inc.

TITEFLEX, INC. 35
Agency—John Falkner Arndt & Co.

TRANSPORT EQUIPMENT CO. 75
Agency—Jaycraft Co.

UTICA DROP FORGE & TOOL CORP. 61
Agency—Wilson, Haight & Welch, Inc.

VICKERS-ARMSTRONG COMPANY 42
Agency—Intam Limited

VICKERS, INC. 97
Agency—Witte & Burden Adv.

VLIER MFG. CO. 64
Agency—Willard G. Gregory & Co.

WESTERN GEAR WORKS 58
Agency—Ruthrauff & Ryan, Inc.

WESTINGHOUSE ELECTRIC CORP. 80, 81
Agency—Fuller & Smith & Ross, Inc.

WHITTAKER CO., LTD., WM. R. 38
Agency—Mogge-Privett, Inc.

WIGGINS OIL TOOL CO., E.B. 40
Agency—Anderson-McConnell Adv. Agency

WILCOX ELECTRIC CO. 53
Agency—Carter Adv. Agency, Inc.

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 88-92
Positions Wanted 90
Selling Opportunities Wanted 90
Employment Agencies 90

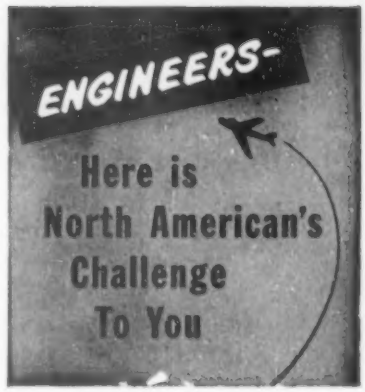
EDUCATIONAL
Schools 92

PLANES—EQUIPMENT
(Used or Surplus New)
For Sale 92-95

The Stephen-Douglas Co. INC.

LICENSED ENGINEERS • R & D SPECIALISTS

2950 NEBRASKA AVENUE
SANTA MONICA, CALIFORNIA
TELEPHONE EXbrook 3-4765



Frankly, working at North American requires hard thinking and plenty of vision. Because North American always works in the future. Yet, if you are interested in advanced thinking, if you'd like to work on the planes that will make tomorrow's aviation history, you'll like working at North American. North American offers these extra benefits, too.

North American Extras—

Salaries commensurate with ability and experience • Paid vacations • A growing organization • Complete employee service program • Cost of living bonuses • Six paid holidays a year • Finest facilities and equipment • Excellent opportunities for advancement • Group insurance including family plan • Paid sick leave • Transportation and moving allowances • Educational refund program • Low-cost group health (including family) and accident and life insurance • A company 24 years young.

Write Today

Please write us for complete information on career opportunities at North American. Include a summary of your education, background and experience.

CHECK THESE OPPORTUNITIES AT North American

- Aerodynamicists
- Stress Engineers
- Aircraft Designers and Draftsmen
- Specialists in all fields of aircraft engineering
- Recent engineering graduates
- Engineers with skills adaptable to aircraft engineering
- Electrical and Electronic Engineers

NORTH AMERICAN AVIATION, INC.

Dept. 10, Engineering Personnel Office
Los Angeles International Airport
Los Angeles 45, Calif.; Columbus 16, Ohio

North American Has Built More Airplanes Than Any Other Company In The World

EDITORIAL

What Happens to Aircraft Profits?

President William M. Allen's answer to this question is that more of Boeing Airplane Company's profits are plowed back into the national security effort than ever go to the stockholders.

The dizzying pace of aeronautical progress is creating more difficult problems for the aircraft industry in its efforts to build up substantial reserves of material and monetary strength.

Mr. Allen brought this matter of profits and reserves up to date in succinct fashion at a meeting of Boeing-Wichita supervisors last week.

"We must maintain a vast complex of skills and machinery and ever-advancing research facilities, if we are to keep the wheels going around," he says. "But to accomplish this, we must feed back into the business most of what we take out."

This point is made all too rarely in the press and we think the public does not realize it, as they scan the individual profit-and-loss figures announced each spring and summer by the airplane manufacturers.

For example, Mr. Allen notes that in the past 10 years Boeing has run up earnings of some $70 million. But $50 million of this has been plowed back into the business to keep Boeing abreast of progress. "To accomplish this, our stockholders have been restricted to an exceedingly modest return on their investment." Actually, they have received less than 30% of the company's net earnings.

In most industries, Mr. Allen notes pointedly, the average paid out in dividends runs from 50 to 60%.

"If we were engaged in the manufacture of shoes, or flour, or other commercial articles, there would probably not be too great a loss to our country's security if we went out of business and devoted our respective efforts in other directions. Someone else would come along and do the job for us. But our situation is quite different. . . . There would be a great loss to the security of our country if the combination of skills and know-how that we have been accumulating and building into a team for the past 36 years did not continue to serve our country. . . . What better demonstration could there be than the consistent use of most of the company's earnings to enable it to do a better job?"

Boeing in the past three years has authorized expenditure of more than $22 million for capital assets. Its management wishes it could do even more in the way of building its own strength with its own money. "It would be the healthiest way for all concerned if Boeing could do the entire job itself. That, ideally, is the way of private enterprise," Mr. Allen says. "But since Boeing cannot do it all, the government must help. The Air Force has approved facilities expenditures which are even larger than the amount that has been expended by the company."

Mr. Allen drives home the message that if the aircraft industry had been permitted to earn more, it would not have been necessary for the government to make such a large investment in facilities.

"The net income of the aircraft industry, and of Boeing over the years, has approximated 2% of sales. Other manufacturing industries average from 5 to 6%. . . ."

This substantial plowing-back of profits has been an important element of Boeing's management philosophy, Mr. Allen emphasizes. "It is a concrete demonstration that Boeing is fully aware of its responsibilities to the people and the government of the U. S."

This management philosophy is well known to those of us in aviation, but it deserves wider publicity and understanding elsewhere.

Trade—Not Aid

That offer of Gen. Mark Clark to award $100,000 to the first Red pilot who surrenders a MiG to the United Nations aroused a hornet's nest in some vocal quarters in Britain.

It seems it wasn't quite proper.

Several members of Parliament protested bitterly. A Laborite told the House of Lords it "was a dastardly proposal to attempt to bribe Chinese airmen to commit treason," and "in the whole history of warfare this is one of the most terrible things that has ever happened."

Two London newspapers said it was "mistimed" and "curious," and the British-Soviet Friendship Society joined in lamenting the harm that might be done to truce talks.

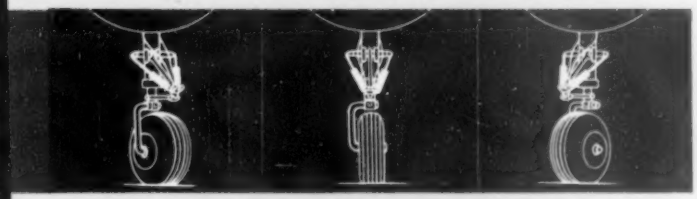
Our hearts bleed for these critics. Throughout history, soldiers have given up voluntarily to their adversaries. And for almost two weeks after Gen. Clark's announcement the MiGs stayed behind the Yalu in their sanctuary. Perhaps some fine American lives were spared in that interval—and others may be spared if we learn all the MiG's secrets. Perhaps even a few British lives will be saved, for allegedly they are fighting the Korean war by our side.

It probably is not quite proper, either, to remind these sensitive critics that the British sale to the Russians of that "insignificant" batch of "outmoded" Nene jet engines a few years back helped make the MiG what it is today, a more effective machine than many aircraft the United Nations are building in the same class. Thanks partly to improved Russian copies of those old Nenes.

—Robert H. Wood

Bendix Torque-Link Steering

A new and better steerable nose gear design... Easier and more efficient steering action... Important savings in weight, space and maintenance.



Bendix Torque-Link Steering is a rugged self-contained unit which can be built in as an integral part of any nose strut.

This simple compact steering unit actually does the work of two conventional mechanisms. The hydraulic power cylinders take the place of the upper scissor member of usual torque links. They serve the double purpose of torque links and steering actuators. Thus, with one unit performing dual functions, Bendix Torque-Link Steering obtains important savings in weight, space and maintenance.

In addition, shimmy dampening is more effective because dampening forces are applied at a point where there is the least amount of spring action in the system.

Although Bendix Torque-Link Steering is a new conception of more efficient steering action, it has been fully tested and proved. After exhaustive laboratory tests it is now being used on several of the newer planes with excellent results.

Bendix engineers welcome the opportunity to assist air frame designers in the application of this Torque-Link Steering to their new airplanes.

BENDIX PRODUCTS DIVISION **SOUTH BEND** INDIANA

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N.Y.

LEADER IN LANDING GEAR

FIRST IN FUEL METERING

Bendix Products Division

OPPORTUNITIES FOR ENGINEERS
in Electronics, Mechanics and Hydraulics

Bendix Products offers exceptional opportunities to engineers. This division of Bendix is among the world leaders in developing and manufacturing a wide variety of products currently in use by commercial as well as military aviation. Investigate your opportunities with Bendix. Write Administrative Engineering, Bendix Products Division, Bendix Aviation Corporation, South Bend, Indiana.

ON THE NATION'S AIRLINES

in Pratt & Whitney Aircraft Engines

Our nation's airlines still rely 100% on reciprocating engines because of their sturdy record of reliability and fuel economy. Leader in the development of more powerful aircraft engines has been the famous Wasp and Wasp Major series produced by Pratt & Whitney Aircraft.

For many years, Foote Bros. have manufactured precision gearing for engines manufactured by Pratt & Whitney Aircraft, and this gearing has played its part in the superb service these engines have given the American public.

FOOTE BROS. GEAR AND MACHINE CORPORATION
4545 South Western Boulevard • Chicago 9, Illinois

Foote Bros. Gearing and Mechanical Drives are also contributing to the successful operation of many of the nation's leading jet engines. Many of these jet engines are manufactured by Pratt & Whitney Aircraft for the Air Force and Navy.

FOOTE BROS.

Better Power Transmission Through Better Gears